IC 10: Advanced Techniques in Needle Aponeurotomy and Collagenase -Going Beyond the MP Joint

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IC10

Advanced Tips, Pearls and Techniques for Needle Aponeurotomy (NA and PNF)

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ABSTRACT

Dupuytren disease is a benign inherited fibromatosis of the fascia of the hand and fingers. It leads to progressive contracture, which alters hand function. There is no known "cure" for Dupuytren contracture.

Dupuytren contracture is traditionally treated with open surgical procedures, most commonly partial palmar fasciectomy. There are numerous problems associated with open fasciectomy. Regional or general anesthesia is often required. Recurrence rates vary from 12% - 73% and there is a significant complication rate reported between 3.9 to 39%. It is common for patients to require an extended period out of work and away from sports and an extensive course of postoperative hand therapy is often necessary. Even after meticulous removal of diseased fascia, the disease and contracture can recur.

Needle aponeurotomy (NA/PNF) and Clostridium Histolyticum Collagenase (CCH, Xiaflex, Xiapex) injection are new minimally invasive methods used to treat Dupuytren contracture. Compared to fasciectomy, they have a lower complication rate and recovery is more rapid. Patients can return to work and sports more quickly. These procedures can be performed under local anesthesia in an office or clinic setting. The overall cost is lower, however, recurrence rates are higher than with open surgery.

This instructional course examines the history of minimally invasive treatment and the anatomy and physical examination of the pathologic cords. Reported outcomes, efficacy and recurrence rates are reviewed. Precise step-by-step techniques for performing NA and CCH are presented. Emphasis is placed on accuracy, maximizing

correction and minimizing potential complications. Tips and pearls from the author's fifteen-year experience are discussed.

INTRODUCTION:

Dupuytren disease is a benign fibromatosis of the fascia of the hand and fingers. It begins with a palpable mass or nodule. This is usually located between the proximal palmar crease and distal palmar crease, but the nodule may first present in the finger. Enlargement of the nodule, leads to the development of pathologic cords which thicken and contract, causing contracture of the metacarpophalangeal (MP) and proximal interphalangeal (PIP) joints. Other areas affected include the distal interphalangeal (DIP) joint and web spaces.

Dupuytren disease is an inherited disorder that is autosomal dominant with variable penetrance[1]. It is most commonly seen in older Caucasian males of European descent, but can be found in people of all backgrounds. There is a higher incidence with advancing age and the peak age in the males is in the 50's[2]. There is a 3.5:1 – 9:1 male to female ratio[3]. The disease appears later in women than men, with women catching up to men in their 80's. The overall prevalence of Dupuytren contracture is uncertain, but is believed to range from 0.2% to 56%[4,5]. Estimated incidence in the USA ranges from 1-7%[6]. It is often misdiagnosed and undertreated.

The most commonly affected digits are the ring finger and little finger (50-60%), followed by the thumb, middle finger, and index finger[7]. Dupuytren contracture is usually bilateral, with an incidence of 42-98%[8]. The disease may also be associated with ectopic lesions, including Garrod's nodules (dorsal PIP joint fibromatosis), Peyronie's disease, and Ledderhose's disease[4,9,10]. Hueston described this group of fibroproliferative diseases as Dupuytren diasthesis[11,12]. He recognized that risk factors including early age of onset

(<age 50), bilaterality, strong family history and ectopic lesions predispose a patient to a poorer prognosis with rapid progression and higher recurrence after treatment. More recent studies have concluded that the worst outcomes were associated with plantar fibromatosis, Garrod's nodules, radial sided involvement, early onset (<age 50), male sex and the small finger requiring surgery[13,14].

HISTORY OF MINIMALLY INVASIVE TREATMENT

Henry Cline[15] proposed treatment of the contracture in 1777. He used a blade to section the contracted cords, performing a fasciotomy or aponeurotomy. Cooper (1822)[16], performed a percutaneous fasciotomy, using a pointed bistoury to divide the pathological cords. Percutaneous procedures were commonly used throughout the 1800's and were documented by Adams[17] (1892). Open excision of the abnormal fascia became the standard treatment after the introduction of general anesthesia in the mid 1800's. Fergusson (1842)[19] proposed treatment by open excision of the diseased fascia and Goyrand (1883)[18] performed a limited fasciectomy.

Luck (1959)[20] reintroduced subcutaneous fasciotomy for the involutional and residual stages of Dupuytren disease. Using a fasciatome, he sectioned the fibrous cords subcutaneously at multiple levels in the palm. For the involutional stage, he also recommended open resection of the palmar nodules.

Lermusiaux and Debeyre (1972)[21] described using a needle, rather than a knife, to divide the cords. Needle fasciotomy was less invasive than open fasciectomy, and patients had a quicker recovery of function. Badois, Lermusiaux, Masse and Kuntz (1993)[22], Foucher, Medina and Navarro (2003)[23], and van Rijssen and Werker (2006)[24] subsequently reported on the use of fasciotomy, and its acceptance increased. This has been supported in recent years with the work of Eaton (2011) [25], Pess, Pess and Pess (2012) [26], Diaz and Curtin (2014) [27], Morhart (2014) [28] and McMillan and Binhammer (2014) [29].

Collagenase clostridium histolyticum (CCH, Xiaflex, Xiapex) is an enzymatic treatment for adult patients who have a palpable cord. Hurst and Badalamente studied CCH extensively, first in vitro on excised Dupuytren cords (1996) [30] and then in Phase III clinical trial (2007) [31]. This was followed by double-blind, placebo-controlled multicenter trials CORD I (2008), CORD II (2009), JOINT I (2013), JOINT II (2013), CORDLESS (2013) and the MULTICORD study (2015)[32-37]. Xiaflex was approved for use in the United States on February 2, 2010. The sBLA was approved on October 20, 2014, allowing the treatment of up to two joints in a single treatment visit and permitting delayed manipulation 24 – 72 hours after injection. Use of collagenase is restricted to clinicians who have undergone the three-step training, enrollment and registration procedure with the manufacturer.

The current drug is a predetermined mixture of AUX 1 and AUX 2 collagenase that cleaves collagen molecules at different locations. AUX 1 and AUX 2 work synergistically to provide hydrolyzing activity and rapidly degrade collagen. CCH is less active against Type IV collagen, which is found in the basement membrane of blood vessels and the perineurium of peripheral nerves.

Non-surgical treatments for Dupuytren contracture include splinting, hand therapy, radiation therapy[38], intralesional steroid injections[39,40] and CCH injection. Minimally invasive procedures include needle aponeurotomy (NA) / percutaneous needle fasciotomy (PNF).

OPEN SURGICAL PROCEDURES

The "Gold Standard" for treatment of patients with Dupuytren contracture is fasciectomy and surgery is still the most common intervention. Open surgical procedures include standard limited fasciectomy, segmental fasciectomy, radical fasciectomy, dermofasciectomy and open fasciotomy[11,41-48] .

There are numerous problems associated with open fasciectomy. Regional or general anesthesia is often required. Recurrence rates vary from 12% - 73%[26]. There is a significant complication rate reported between 3.9 and 39%[49]. Serious complications including delayed wound healing, hematoma, scar pain, infection, dysesthesia, nerve laceration, arterial laceration, PIP joint dislocation and CRPS. It is common for patients to require an extended period out of work and away from sports. An extensive course of postoperative hand therapy is often necessary to decrease sensitivity of scars and maximize post-operative range of motion and strength. Some patients never regain full flexion. The total cost of treatment is higher than NA or CCH[50].

ANATOMY and PHYSICAL EXAMINATION of CORDS

Dupuytren disease consists of a combination of nodules, skin pits and cords. Common cords include:

1) Pretendinous cord – originates from pretendinous band, begins proximal to the proximal finger crease, contracts the MP joint of fingers or thumb.

2) Central cord – located midline between neurovascular bundles and distal to the proximal finger crease, is a continuation of the pretendinous cord, contracts the PIP joint.

3) Lateral cord – composed of diseased lateral digital fascia, located superficial to neurovascular bundle, contracts PIP joint.

4) Retrovascular cord – located deep to neurovascular bundle, can contract both the PIP and DIP joints.

5) Natatory cord - contracts the 2nd, 3rd and 4th web spaces.

6) Commisural cords (proximal and distal) - contracts the 1st web space, may be rope-like in consistency.

7) Abductor digiti minimi cord - contracts the little finger MP and PIP joints. Can displace the neurovascular bundle in a volar, midline and distal direction.

8) Spiral cord – contracts PIP joint - usually a combination of pretendinous cord, diseased lateral digital fascia and Grayson's ligament. Can displace neurovascular bundle in a volar, midline and distal direction.

INDICATIONS FOR TREATMENT

There is no "cure" for Dupuytren contracture, no matter what treatment is chosen[51]. Once present, the contracture does not resolve spontaneously. Achieving perfection is not necessary, especially when treating a disease that has a significant recurrence rate. Patients appreciate improvement of function and increase in range of motion, even without achieving full extension. When severe, long-standing contractures are present, the patient's expectations need to reasonable.

When performing minimally invasive procedures for Dupuytren contracture, **treat early**. Since minimally invasive treatments have a lower morbidity and risk, the old paradigm of waiting for an MP or PIP contracture of 30˚ does not pertain. The highest efficacy and lowest recurrence rates are in patients with the early disease and minimal arthrofibrosis of the PIP joint. If a contracture recurs, minimally invasive treatments should be repeated early.

Prior to performing any procedure, a diagram of the hand is used to chart nodules, cords, previous surgical incisions and skin grafts, range of motion and degree of contracture. All abnormal cords should be identified by palpation and illustrated with a marker. The underlying pathology should be visualized in a three-dimensional pattern, which is necessary to plan needle entrance points and sites for CCH injection. Skin creases should be avoided for both needle insertion and CCH injection. The ideal locations for CCH injections and NA insertion are areas where the cord is maximally bowstringed, which increases the distance between the cord and the flexor tendons and neurovascular bundles. Supple skin, when available, is optimal for needle placement. Care should be

taken to avoid the neurovascular bundle when a spiral or ADM cord is present. Only pathologic cords are released. Scarred and contracted skin from previous open surgery and skin grafting are not treated.

Step-by-step technique is described in the following section. This is designed to give guidance and provide knowledge to allow most finger contractures (including PIP joint contractures) to be treated with either NA or CCH.

TECHNIQUE:

NEEDLE APONEUROTOMY (NA) / PERCUTANOUS NEEDLE FASCIOTOMY (PNF)

Needle aponeurotomy is performed in an outpatient treatment room under local anesthesia with the patient recumbent[26]. For patients who require anesthesia, light monitored anesthesia care (MAC) sedation can be utilized in a surgery center setting. If anesthesia is used, an experienced anesthesiologist is essential, so that it can be assured that the patient remains responsive to stimuli. Constant communication with the patient is mandatory.

The patient's hand is prepped with antiseptic solution. A stack of folded towels is placed under the hand to aid in extension of the MP and PIP joints. Portal sites are carefully chosen between skin creases in areas of definite cords and are marked with a surgical marker. The injections sites may need to be modified after releasing the MP joint. The center of the cord is normally used as the needle entrance site, but 2 parallel insertion sites, radial and ulnar, may be used for wider cords > 5mm[52].

Intradermal anesthesia is performed with <1cc lidocaine 1% plain injected in the area of the palmar portals, prior to the release of any cords. Only the dermis is penetrated and injection is performed as the needle is withdrawn. This syringe is placed aside.

A 5cc syringe is filled with 3cc lidocaine 1% plain and 1cc methylprednisolone acetate injectable suspension 40mg (Depo-Medrol, Pharmacia & Upjohn Co., New York, NY). Corticosteroids are not used for patients with diabetes mellitus. Short 25-gauge, 16-mm (5/8-in) length needles are used exclusively. Use of larger needles is not recommended. A tourniquet is

not applied. Patients are asked to stop anticoagulation, if possible, but blood thinners are not considered a contraindication to the procedure.

Each time a portal is entered, 0.1cc of the lidocaine/corticosteroid mix is injected into the local area, and the needle is used as a scalpel to release the cord at multiple levels from proximal to distal. A "pinch and poke" technique is employed. The cord is palpated and then pinched between the fingertips. The needle is aligned perpendicular to the cord. The finger is flexed and extended immediately after each needle insertion to confirm that the needle is not placed within the flexor tendon. Insertion portals are made at the areas of maximum bowstringing of a palpable cord. Areas farthest from the neurovascular bundle are selected and the patients are constantly asked if they feel any electric shocks. Portals are spaced 5mm apart and skin creases are avoided[11]. No Doppler or ultrasound is used. Care is taken to not push the needle in too deep. Most cords are less than 4mm from the skin, so the needle can remain fairly superficial. The distance between hub of the needle and the skin is watched closely at all times.

To confirm a good portal site, apply traction and look for blanching[51]. If the diseased cord is tighter than the skin, the skin will usually not blanch with traction. Blanching may indicate that the skin is contracted and there may not be an underlying cord present to release. Blanching will advance distally when the underlying cord has been adequately released.

Three maneuvers are used: **perforate**, **slice**, and **clear**. An up and down **perforation** of the cord is performed with the needle oriented vertically. A gentle pendulum side-to-side **slicing** motion is used with the needle tip perpendicular to the cord's longitudinal axis.

Division of the cord progresses from superficial to deep. It can sometimes help to push the cord against the needle while slicing. The three-dimensional anatomy of the cord should be kept in mind at all times. In areas of pitting, a tangential **clearing** motion or **subcision** is employed to separate the cord and nodule from the dermis. This helps to lower the incidence of skin tears. A crackly feeling is noted as the fibers are released. The needle should be changed frequently to maintain sharpness (~15-25). Gentle extension tension is placed on the cord during the release, and then passive extension is used to rupture the cords. A pop may be heard or felt. The finger is then manipulated in abduction, adduction, pronation and supination to release all cords. Unaffected adjacent fingers should also be manipulated, since this can help disrupt any residual cords.

Natatory cords are released by orienting the needle parallel to the longitudinal axis of the finger (perpendicular to the transverse axis of the cord). The cord is then released with a slicing motion, moving proximally to distally. The released cord is massaged to help disrupt remaining deep fibers. Massaging is also useful for narrow lateral cords.

After completing the release distally, the palm and finger are reassessed for residual cords. Each of these cords is released, again working in a proximal to distal direction. A PIP joint contracture may still persist even after all cords are released. There is often a non-palpable central cord preventing release of the PIP contracture. A palmar release of this cord can be performed in the midline, proximal to middle finger crease. It is critical to stay very superficial and avoid entering the flexor tendon sheath. A hidden retrovascular cord can be found through meticulous palpation and is easily released.

Releasing the transverse retinacular ligaments, both radially and ulnarly, can help correct a difficult PIP joint contracture. The ligament is released in a transverse direction, staying dorsal to the neurovascular bundles.

Subcision, using a bent 25 or 18 gauge needle, frees up tethered skin and creases. It also allows more skin mobility. The release is done superficially over the central cord at the MP and PIP joint creases.

A fixed Boutonnière deformity left untreated leads to rapid recurrence after NA. Release the terminal extensor tendon using a 25 gauge needle over the middle phalanx head. Enter both radially and ulnarly for complete release and have the patient actively flex the DIP joint to confirm release.

DIP joint contractures can also be released by carefully staying superficial and avoiding the neurovascular bundles and FDP tendon.

In patients with severe PIP joint contractures, a nerve block (wrist or digital) and/or PIP joint injection with lidocaine1% plain is used for supplementary anesthesia. This is performed after NA is completed to help reduce pain during the extension procedure. After all possible cords have been released; nodules are injected with the mixture of lidocaine and corticosteroid[28].

A light dressing with gauze bandage is applied, and removal of the bandage is allowed that evening. A splint is fitted immediately post-procedure and night use is recommended for three to four months. Even though a splint is recommended, there is no scientific evidence supporting the use of a post-procedure splint[53]. Patients are instructed to exercise at home 5-10 minutes twice a day for 4 weeks. Written instructions are provided,

including specific active range of motion exercises in flexion, extension, abduction and adduction and gentle passive stretching. It is recommended that patients avoid heavy grasping for the first 2 weeks. Therapy is not needed in most instances. Hand therapy with splinting can be ordered for residual contractures and to treat PIP joints that have regained full passive extension, but have a residual active extension lag (central slip laxity)[54].

AUTHOR'S TIPS AND PEARLS
NEEDLE APONEUROTOMY

-Flex and extend finger after each needle insertion to confirm needle not in flexor tendon
-Maintain tension on cord
-The needle is aligned with the bevel perpendicular to cord
-Release perpendicular to the longitudinal axis of the cord
-Change needles frequently
-Choose areas of maximum bowstring for insertion. Select areas farthest from NV bundle.
-Communication with patient is necessary - repeatedly ask patient if they feel electric shocks
-Usually center of cord, but side by side portals for thick cords > 5mm
-Release proximally to distally, allowing easier and safer release of PIP joint
-Manipulate finger in extension, adduction, abduction, pronation and supination
-Manipulate unaffected adjacent fingers too
-Massage cords with thumb to help disrupt cord (especially useful for narrow lateral cords and natatory cords)
-For residual PIP joint contractures, release the non-palpable central cord, retrovascular cord and the transverse retinacular ligaments
-Inject the PIP joint with anesthesia prior to manipulating severe contractures
-Release the terminal extensor tendon to treat a Boutonièrre deformity

OUTCOMES, EFFICACY AND RECURRENCE

Published reports on the results of fasciectomy and NA use a variety of definitions of both correction of contracture and recurrence[26,55]. The timing of evaluation of the outcome also varies greatly. This makes it difficult to compare results. Standardizing the reporting of results in the future will allow a more meaningful comparison of different treatments for Dupuytren contracture. Efficacy should be defined as correction of the affected joint to ≤5˚ within 90 days of the procedure. Recurrence should be defined as >=20˚ loss of post procedure correction. MP and PIP joint efficacy and recurrence should be evaluated individually since PIP joints have a lower treatment efficacy rate and a higher recurrence rate[56].

The French experience with NA has been reported by several groups of surgeons and rheumatologists. Badois, Lermusiaux, Masse and Kuntz (1993) published, in French, the results of NA[22]. There were no major complications, though there was a skin break in 16%, digital dysesthesia in 2%, and infection in 2%. Bleton, Marcireau and Almot (1997) documented the results of a prospective study of NA[57]. All complications were minor including skin tear in 4%, temporary paresthesia in 2% and superficial infection in 1%. Lermusiaux, Lellouche, Badois and Kunz (1997) related the results of a large number of NA procedures[58]. An improvement of over 70% was observed in 81% of hands. The complication rate was 0.05% for both tendon and digital nerve injuries. Foucher, Medina and Navarro (2003) reported a 79% gain in extension for the MP joint and 65% for the

PIP joint[23]. There was one digital nerve injury. A subgroup of 100 patients had a recurrence rate of 58% after mean follow-up of 3.2 years.

Van Rijssen and Werker (2006), described a post-procedure improvement of 71% (from average of 62˚ to 18˚)[24]. The recurrence rate was 65%. Their definition of recurrence was an increase in the passive extension deficit of ›30˚. Two patients had diminished sensibility (3%). There were no flexor tendon injuries.

Van Rijssen, Linden and Werker (2012), reported the results of randomized, controlled study, which compared the outcome of NA/PNF and limited fasciectomy after 5 years. The 5-year recurrence rate was 85%. However patients who recurred still preferred PNF over fasciectomy for repeat treatment[59].

Pess, Pess and Pess (2012) reported an extensive series of 1,013 fingers treated with a minimum follow-up of 3 years[26]. There was an immediate post-procedure correction of MP and PIP joint contractures from 35˚ to 1˚ and 50˚ to 6˚ respectively. At final follow-up, the mean MP and PIP joint contractures were 11˚ and 35˚. The difference in correction was statistically significant for MP vs. PIP joints and for age under 55, compared to 55 and over. Successful correction to a residual contracture of ≤5˚, after 1 procedure, was achieved in 98% of MP joints and 67% of PIP joints. Recurrence was defined as an increase of contracture >20˚, compared to post-procedure correction. Minimum follow-up was 3 years (range 3.0-6.2 years). The recurrence rate was 20% for MP joints and 65% for PIP joints. An improvement of extension ≥50% of the initial contracture was maintained at final follow-up in 75% of MP joints and 33% of PIP joints. Complications were rare, except for skin tears, which occurred in 3.4% of digits. All tears

healed without any intervention other than local wound care. There was a temporary neuropraxia in 1.2% of patients, and a presumed nerve laceration in 0.1% (ulnar digital nerve of little finger). There were no known instances of arterial laceration, tendon rupture, pulley rupture, hematoma, infection, or complex regional pain syndrome, and no patient was hospitalized.

McMillan and Binhammer[29] (2015) compared the long-term results of 54 patients who underwent NA combined with a series of triamcinolone acetonide injections (Sandoz Canada Inc., Boucherville, Quebec) or who underwent NA alone. The injections were given immediately post-NA and again at 6 weeks and 3 months later. Mean Total Active Extension Deficit (TAED) was significantly less in needle aponeurotomy triamcinolone acetonide patients at 6 months and between 13 and 24 months. Mean time to retreatment and mean TAED immediately prior to retreatment did not differ significantly between groups. Kaplan-Meier survival estimates demonstrated a significantly higher percentage of NA group patients expected to return for retreatment by 24 months, but not by 36 months.

COMPLICATIONS

Side effects are uncommon after NA. The most common complaints are pain, swelling and ecchymosis. Analgesics can be offered to patients.

Skin tears are relatively common after NA with an incidence of ~3-4%. Tears are treated initially with pressure and elevation. Patients are instructed in local wound care and dressing changes. Any exposed tendon is kept moist until the wound granulates, because if it doesn't dry, it won't die. Skin grafts, rotation flaps and other types of coverage are not necessary. All skin tears heal within 2-6 weeks.

Serious complications occur infrequently. Infection is usually superficial and can be treated with oral antibiotics. Transient neurapraxia is more common than complete nerve laceration. Tendon rupture and arterial laceration are rare.

CONCLUSION

There is no cure for Dupuytren contracture. No matter what procedure is chosen, the disease may recur. Until a genetic or disease-modifying treatment can be found, minimally invasive treatments should be considered. These techniques offer a combination of excellent efficacy, significant improvement of range of motion, low complication rate and quick recovery.

BIBLIOGRAPHY

1. Ling R. The genetic factor in Dupuytren's disease. J Bone Joint Surg Br. 1963; 45:709-718.
2. Swartz WM, Lalonde DH. Dupuytren's disease. Plast Reconstr Surg. 2008; 121(4): 1-10
3. Ross D. Epidemiology of Dupuytren's Contracture. Hand Clin. 1999; 15: 53-62.
4. Bayat A, Cunliffe EJ, McGrouther DA. Assessment of clinical severity in Dupuytren's disease. Br J Hosp Med. 2007; 68: 604-609.
5. Hindicha S, McGrouther DA, Bayat A. Epidemiological evaluation of Dupuytren's disease incidence and prevalence rates in relation to etiology. Hand 2009; 4: 256-269.
6. DiBenedetti DB, Nguyen D, Zografos L, Ziemiecki R, Zhou X. Prevalence, incidence and treatments of Dupuytren's disease in the United States: results from a population-based study. Hand 2011; 6: 149-158.
7. Leclerq C. Non-surgical treatment. In: Tubiana R, Leclerq C, Hurst L, Badalamente MA, Macklin EJ, editors. Dupuytren's disease. London: Martin Dunitz; 2000.
8. McFarlane R. Some observations on the epidemiology of Dupuytren's disease. In Hueston J, Tubiana R, editors. Dupuytren's disease. 2nd ed. GEM's monographs. Edinburgh: Churchill Livingstone; 1985. p. 122-126.
9. Trojian TH, Chu SM, Dupuytren's disease: diagnosis and treatment. AmFam Physician 2007; 76: 86-89.
10. Dohlem T. On permanent retraction of the fingers, according to Dupuytren. Rev Rhum Engl Ed. 1996; 63: 435-443.
11. Hueston JT. Dupuytren's contracture. Edinburgh: E&S Livingstone, 1963.
12. Hueston JT. State of the art: the management of recurrent Dupuytren's disease. Eur Med Bibliography 1991; 1:4-7.
13. Abe Y, Rokkaku T, Ofuchi W, et al. An objective method to evaluate the risk of recurrence and extension of Dupuytren's disease. J Hand Surg. (Br) 2004; 29(5): 427-430.
14. Hindocha S, Stanley JK, Watson S, et al. Dupuytren's diathesis revisited: evaluation of prognostic factors for risk of disease recurrence. J Hand Surg. (Am) 2006; 31(10): 1626-1634.
15. Cline H. Notes on pathology. London: St. Thomas Manuscript Collection; 1777: 185.
16. Cooper A. A treatise on dislocations and on fractures of the joints. 2nd ed. London: Longman, Hurst; 1823: 570-576.
17. Adams W. On contractions of the fingers (Dupuytren and congenital contractions) and hammer-toe. London: Churchill; 1892.
18. Goyrand G. Nouvelles recherches sur la retraction permanente des doight. Gazette Medicale Paris; 1883:3, 481-486.
19. Fergusson W. A system of practical surgery. London, Churchill; 1842.
20. Luck JV. Dupuytren's Contracture. A new concept of the pathogenesis correlated with surgical management. J Bone Joint Surg. (Am) 1959; 41: 635-664.

21. Lermusiaux JL, Debeyre N. Le traitement medical de la malidie de Dupuytren, Rhumatologique. Paris: Expansion Scietifique; 1979:338-343.
22. Badois FJ, Lermusiaux C, Masse C, Kuntz D. Nonsurgical treatment of Dupuytren disease using needle fasciotomy. Rev. Rhem. (Engl Ed.) 1993; 60: 692-697.
23. Foucher G, Medina J, Navarro R. Percutaneous needle aponeurotomy: complications and results. J Hand Surg. 2003; 28B: 427-431.
24. van Rijssen AL, Werker PN. Percutaneous needle fasciotomy in Dupuytren disease. J Hand Surg. 2006; 31B: 498-501.
25. Eaton C. Percutaneous fasciotomy for Dupuytren contracture. J Hand Surg. 2011; 36A: 910-915.
26. Pess GM, Pess RM, Pess RA. Results of needle aponeurotomy for Dupuytren contracture in over 1,000 fingers. J Hand Surg. (Am) 2012; 37A: 651-656.
27. Diaz R, Curtin C. Needle aponeurotomy for the treatment of Dupuytren's disease. Hand Clin. 2014; 30: 33-38.
28. Morhart M. Pearls and pitfalls of needle aponeurotomy in Dupuytren's disease. Plast Reconstr Surg. 2014; 135: 817-825.
29. McMillan C, Binhammer P. Steroid injection and needle aponeurotomy for Dupuytren disease: Long term follow-up of a randomized controlled trial J Hand Surg. (Am) 2014; 39(10): 1942-1947.
30. Badalamente MA, Hurst LC. Enzyme injection as a nonoperative treatment for Dupuytren's disease. Drug Delivery 1996; 3: 35-40.
31. Badalamente MA, Hurst LC. Efficacy and safety of injectable mixed collagenase subtypes in the treatment of Dupuytren's contracture. J Hand Surg. (Am) 2007; 32: 767-774.
32. Hurst LC, Badalamente MA, Hentz VR, Hotchkiss RN, Kaplan FT, Meals RA, Smith TM, Rodzvilla J. Injectable collagenase clostridium histolyticum for Dupuytren's contracture. N Engl J Med. 2009; 361: 968-979.
33. Gilpin D, Coleman S, Hall S, Houston A, Karrasch, Jones N. Injectable collagenase clostridium histolyticum: a new nonsurgical treatment for Dupuytren's disease. J Hand Surg. (Am) 2010; 35(12): 2027-2038.
34. Watt AJ, Curtin CM, Hentz VR. Collagenase injection as nonsurgical treatment of Dupuytren's disease. J Hand Surg. (Am) 2010; 35(4): 534-539.
35. Witthaut J, Jones G, Skrepnik N, Kushner H, Houston A, Lindau T. Efficacy and safety of collagenase clostridium histolyticum injection for Dupuytren's contracture: short-term results from 2 open-label studies. J Hand Surg. (Am) 2013; 38(1): 2-11.
36. Peimer CA, Blazar P, Coleman S, Kaplan, FT, Smith, T, Tursi, JP, Cohen, B, Kaufman, GJ, Lindau T. Dupuytren's contracture recurrence following treatment with collagenase clostridium histolyticum (CORDLESS study): 3-year data. J Hand Surg. (Am) 2013; 38(1): 12-22.

37. Gaston, G; Larsen, SE; Pess, GM; Coleman, S; Dean, B; Cohen, BM; Kaufman, GJ; Tursi, JP; Hurst, LC. The efficacy and safety of concurrent collagenase clostridium histolyticum injections for two Dupuytren contractures in the same hand, a prospective multicenter center. J Hand Surg. (Am) 2015; 40:1963-1971.
38. Seegenschmiedt MH, Keilholz L, Wielputz M, Schubert C, Fehlauer F. Long term outcome of radiotherapy for early stage Dupuytren's disease: a phase III clinical study. In: Eaton C, Seegenschmiedt MH, Bayat A, Gabbiani G, Werker P, Wach W, editors. Dupuytren's disease and related hyperproliferative disorders: principals, research and clinical perspectives. Berlin: Spring-Verlag; 2012. p. 349-371.
39. Ketchum LD, Donahue TK. The injection of nodules of Dupuytren's disease with triamcinolone acetonide. J Hand Surg. 2000; 25(6): 1157-1162.
40. McMillan C, Binhammer P. Steroid injection and needle aponeurotomy for Dupuytren disease: a randomized controlled study. J Hand Surg. (Am) 2012; 37(7): 1307-1312.
41. McIndoe A, Beare RLB: The surgical management of Dupuytren's contracture. Am J Surg. 1958; 95: 197-203.
42. McCash CR: The open palm technique in Dupuytren's contracture. Br J Plast Surg. 1964; 17:271-280.
43. Gelberman RH, Amiel D, Rudolph RM, Vance RM. Dupuytren contracture. An electron microscopic, biochemical, and clinical correlative study. J Bone Joint Surg. (Am) 1980; 62: 425-432.
44. Hueston JT: Dermofasciectomy for Dupuytren's disease. Bull Hosp Jt Dis. 1984; 44:224-232.
45. Ketchum LD, Hixson FP: Dermofasciectomy and full-thickness grafts in the treatment of Dupuytren's contracture. J Hand Surg. [Am] 1987; 12: 659-663.
46. Dias JJ, Braybrooke J. Dupuytren contracture: an audit of the outcomes of surgery. J Hand Surg. 2006; 31B: 514-521.
47. Ullah AS, Dias JJ, Bhowal B. Does a 'firebreak' full-thickness skin graft prevent recurrence after surgery for Dupuytren contracture?: a prospective, randomised trial. J Bone Joint Surg. (Br) 2009; 91: 374-378.
48. Hurst LC.: Dupuytren's contracture. Wolfe SW, Hotchkiss RN, Pederson WC, Kozin SH. In Green's Operative Hand Surgery. 6th ed. Philadelphia: Elsevier Churchill Livingstone; 2011. p. 141-158.
49. Denkler K. Surgical complications associated with fasciectomy for Dupuytren's disease: a 20-year review of the English literature. Plastic Surg. 2010: 10: 116-133.
50. Donga P., DeKoven M., Kaplan FT., Tursi JP, Lee WC. Costs of collagenase clostridium histolyticum and fasciectomy for Dupuytren's contracture. Am J Pharm Benefits 2015; 7(1): 24-31.
51. Bayat A, McGrouther DA. Management of Dupuytren's disease–clear advice for an elusive condition. Ann R Coll Surg Engl. 2006; 88(1): 3-8.
52. Henry M. Dupuytren's disease: current state of the art. Hand. 2014; 9: 1-8.

53. Skirven TM, Bachoura A, Jacoby SM, Culp RW, Osterman AL. The effect of a therapy protocol for increasing correction of severely contracted proximal interphalangeal joints cause by Dupuytren disease and treated with collagenase injection. J Hand Surg. 2013; 38(4): 684-689.
54. Werker PMN, Pess GM, van Rijssen AL, Denkler K. Correction of contracture and recurrence rates of Dupuytren contracture following invasive treatment: the importance of clear definitions. J Hand Surg. 2012; 37(10): 2095-2105.
55. Felici N, Marcoccio I, Giunta R, Haerle M, Leclercq C, Pajardi G, Willebrand S, Georgescu AV, Pess G. Dupuytren contracture recurrence project: reaching consensus on a definition of recurrence. Handhir Mikrochir Plast Chir. 2014; 46:350-354.
56. Bleton R, Marcireau D, Almot JY. Treatment of Dupuytren Disease by percutaneous needle fasciotomy. In Saffer P, Amadio PC, Foucher G, editors. Current Practice in Hand Surgery. London: Martin Dunitz, 1997:187-193.
57. Lermusiaux JL, Lellouche H, Badois F, Kuntz D. How should Dupuytren contracture be managed in 1997? Rev Rhum. (Engl Ed) 1997; 64: 775-776.
58. van Rijssen AL, Linden H, Werker PN. Five-year resultrs of a randomized clinical trial on treatment of Dupuytren's disease: Percutaneous needle fasciotomy versus limited fasciectomy. Plast Reconstr Surg. 2012; 129: 469-477.

ICL 10
Anatomy and Analysis of Dupuytren Cords

Charles Eaton MD

Financial/Commercial Disclosure: None

Bibliography and more:
https://Dupuytrens.org/ASSH2019

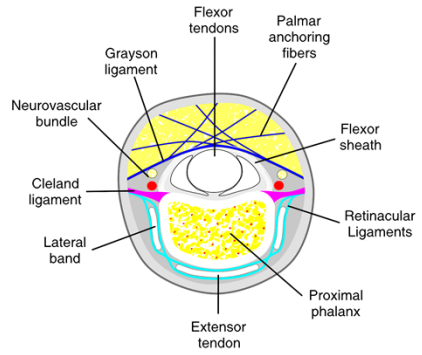
1

The Palmar Fascia

Part of a 3D soft tissue scaffold
- *Anchors* skin to skeleton
- *Redistributes* shear forces
- Provides secure grip

Soft tissue strain is a Dupuytren trigger

2



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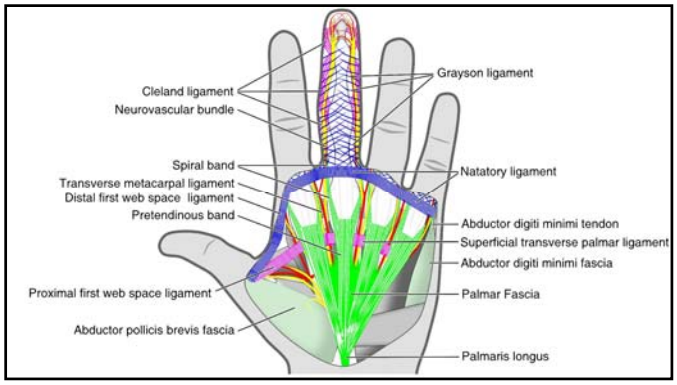
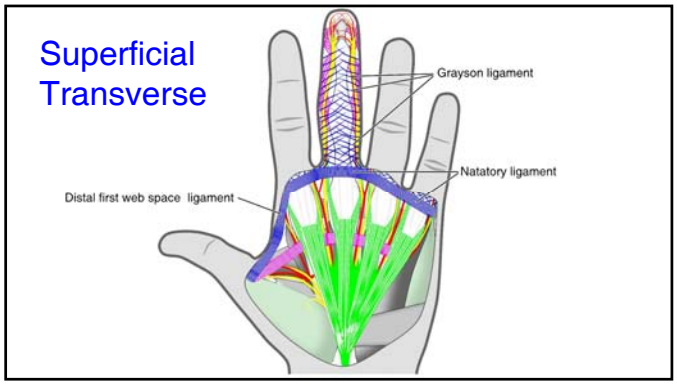
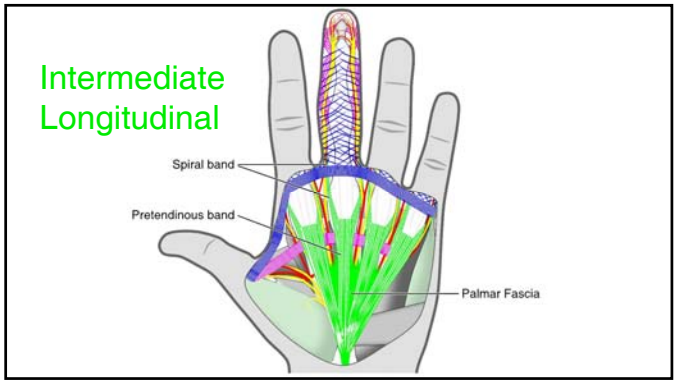

Cleland ligament
Neurovascular bundle
Grayson ligament
Spiral band
Transverse metacarpal ligament
Distal first web space ligament
Pretendinous band
Natatory ligament
Abductor digiti minimi tendon
Superficial transverse palmar ligament
Abductor digiti minimi fascia
Proximal first web space ligament
Palmar Fascia
Abductor pollicis brevis fascia
Palmaris longus

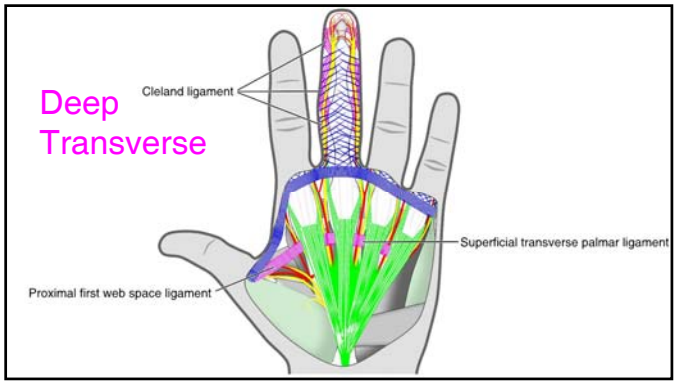
4


Superficial
Transverse
Grayson ligament
Natatory ligament
Distal first web space ligament

5

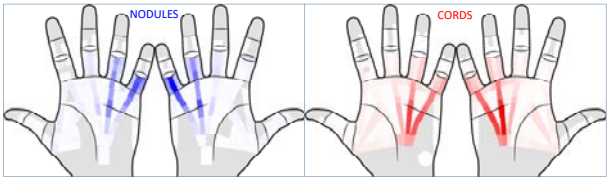

Intermediate
Longitudinal
Spiral band
Pretendinous band
Palmar Fascia

6



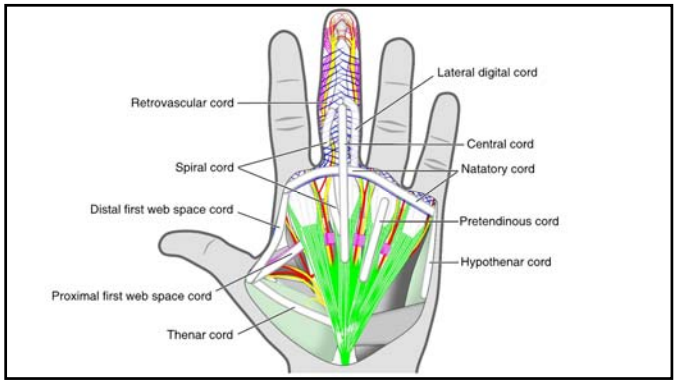
7

Nodule Locations v. Cord Locations



2300 previously untreated patients
Digital Nodules more central, Cords more lateral

9



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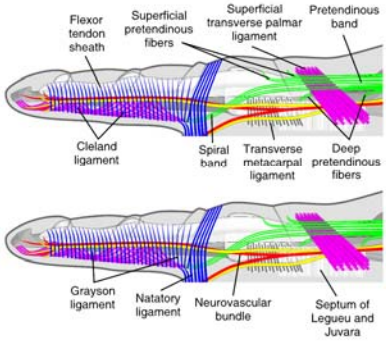

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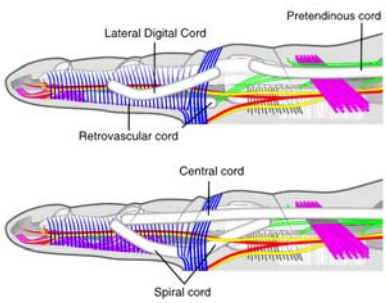
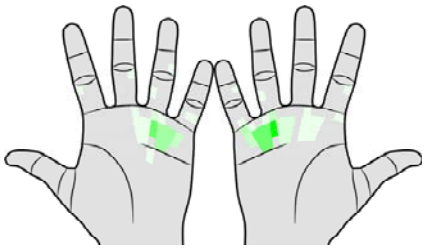


12

Central Bowstrings Central ~~Near NVB~~ ~~Displaces NVB~~	**Retrovascular** ~~Bowstrings~~ Lateral Near NVB Displaces NVB More common if > 45°
Lateral Bowstrings Lateral Near NVB ~~Displaces NVB~~	**Spiral** Bowstrings Central (Prox) Lateral (Distal) Near NVB Displaces NVB

13

Doppler Spiral Locations
70 Previously Untreated Patients

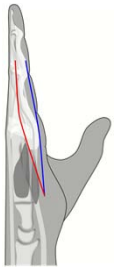


14

Cord Length and Location vs. Angle

- Dupuytren affects ***cords***, not joints.
- We measure joint ***angles***, not cords.
- **How do length changes affect angles?**

Central Cords
Lateral Cords



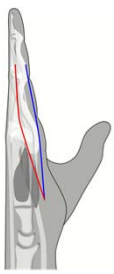
15

Cord Location and Angular Contracture

For the same length change, angles change

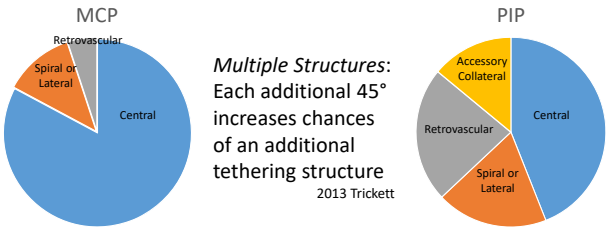
- Lateral = 2X Central
- PIP=2X MCP

Central Cords
Lateral Cords



16

Contribution to overall contracture



Multiple Structures: Each additional 45° increases chances of an additional tethering structure

2013 Trickett

17

Tips on Dupuytren Contracture Incision, Excision, and Dissolve

Keith Denkler Clinical Professor of Surgery, Division of Plastic Surgery, UCSF

Larkspur, Marin County, California

Disclaimer/Conflicts of Interest

I participate in Endo Pharmaceuticals speaker panel.

However, this talk is my own talk about my way of treating those with Dupuytren Disease.

Endo did not assist or review any of this talk.

Historical Treatments: Needle, Collagenase, or Surgery

1777 Closed fasciotomy Cline

1831 Open fasciotomy Dupuytren

1834 Fasciectomy Goyrand

2010 Collagenase. Only new treatment in over 100 years.

The Treatment

Needle does not remove tissue but can change the biology of the contracture

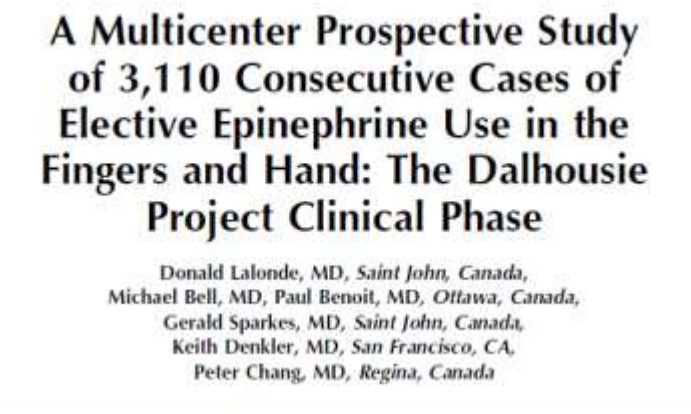
Enzyme dissolves tissue

Fasciectomy removes tissue

I perform all three treatments for Dupuytren Contracture

My wide-awake fasciectomy for Dupuytren contracture published in 2005

I was also part of the original prospective study on epinephrine use in the hand 2005



A Multicenter Prospective Study of 3,110 Consecutive Cases of Elective Epinephrine Use in the Fingers and Hand: The Dalhousie Project Clinical Phase

Donald Lalonde, MD, *Saint John, Canada,*
Michael Bell, MD, Paul Benoit, MD, *Ottawa, Canada,*
Gerald Sparkes, MD, *Saint John, Canada,*
Keith Denkler, MD, *San Francisco, CA,*
Peter Chang, MD, *Regina, Canada*

Needle aponeurotomy

Experience since 2004 in over 7,000 digits

Collagenase

Experience in over 1,600 digits

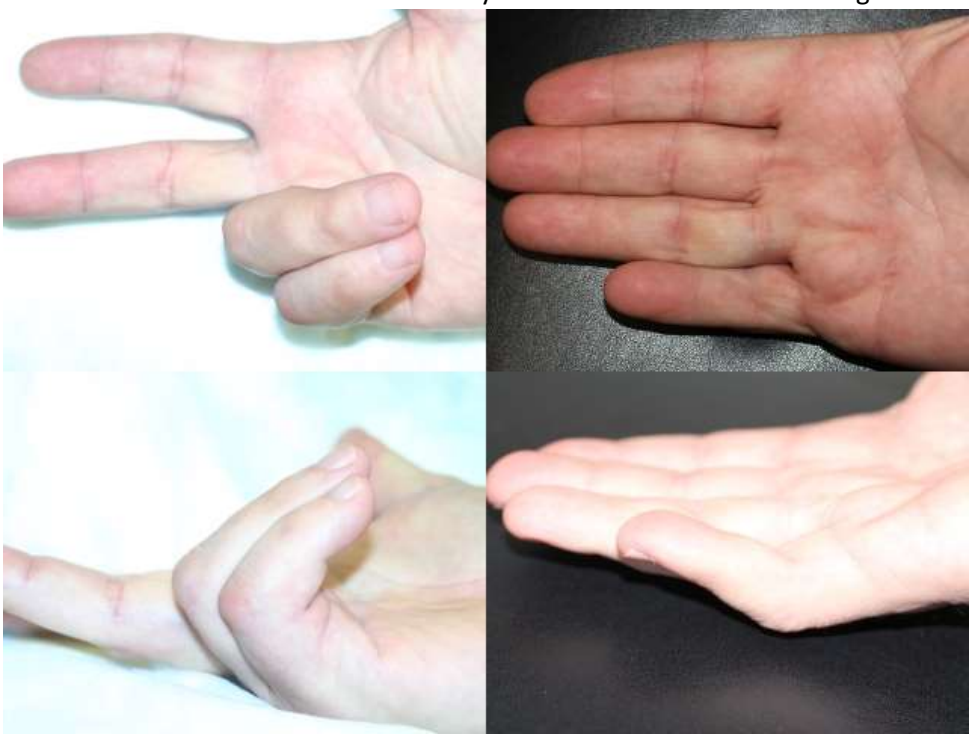
Surgery

Start small or start grand.

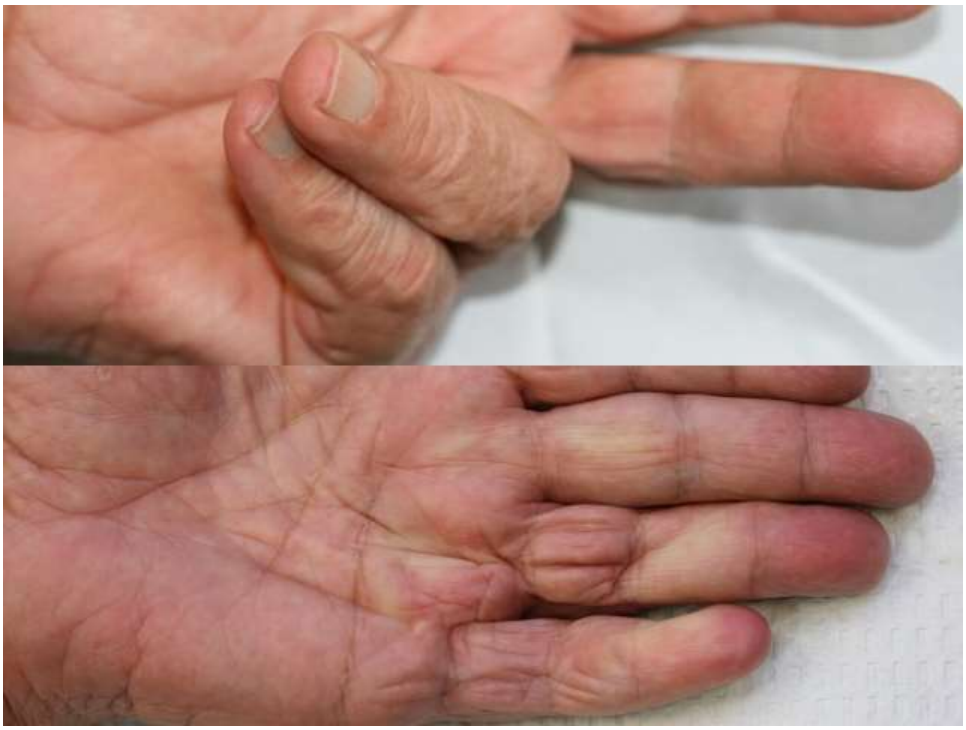
Surgery is the best chance of long term improvement without recurrence

But has the highest complication rate and longest recovery

Lesser treatments such as needle or enzyme can also have excellent long term results



Above: A five-year result from one needle aponeurotomy to Stage IV Dupuytren contracture of the little and ring finger



Above: A seven-year follow-up before and after needle aponeurotomy

Fasciectomy Removes Tissue and Leaves a Volume Deficit

Fig. 3

Evidence-Based Medicine: Options for Dupuytren's Contracture: Inject, Excise, and Dissolve

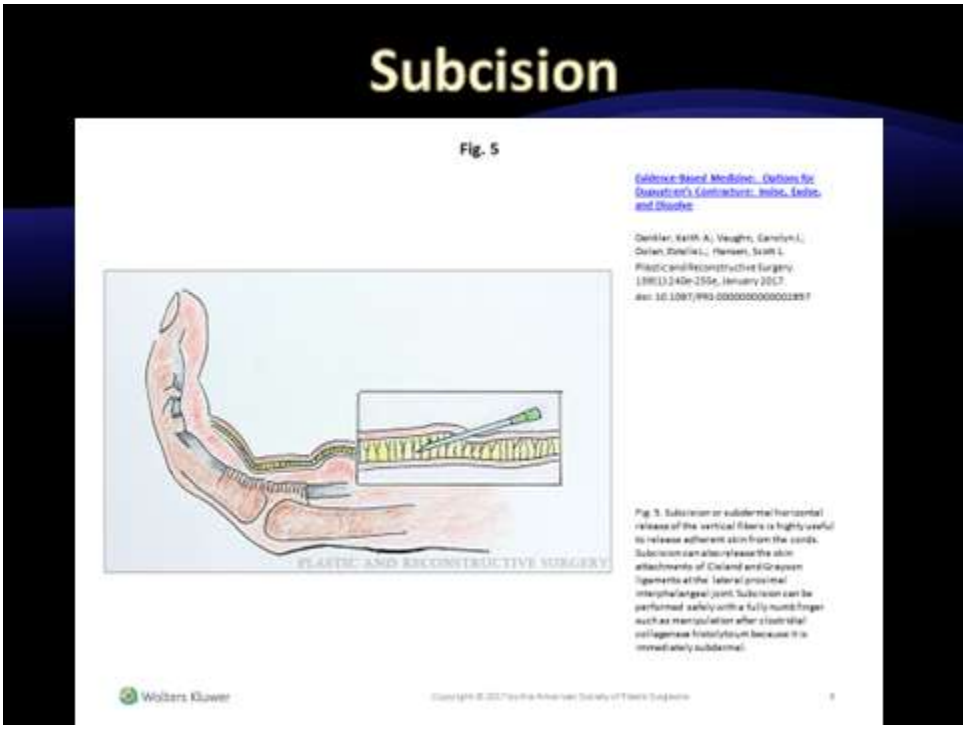
Denkler, Keith A.; Vaughn, Carolyn J.; Dolan, Estelle L.; Hansen, Scott L.
Plastic and Reconstructive Surgery
139(1):240e-255e, January 2017.
doi: 10.1097/PRS.0000000000002857

Fig. 3. (Above) Recurrent Dupuytren's contracture with ~65-degree proximal interphalangeal contracture of the little finger and ~60-degree contracture. (Center) View of wide-awake Dupuytren's limited fasciotomy with insertion of acellular dermis. (Below) Seven-year follow-up. Both fingers gained 45 degrees of extension leaving a residual contracture of 20 degrees in the little finger proximal interphalangeal joint and 15 degrees in the ring finger proximal interphalangeal joint.

Above: My own five-year fasciectomy/allograft follow-up

Subcision

Release of vertical fibers to the skin from the underlying cord



Also can be used to release adherent Grayson's or Cleland's ligaments laterally

Can use local anesthesia hydro-dissection and an 18-gauge needle.

Stay immediately subdermal.

Illustration of Skin Fibers to be released by Subcision

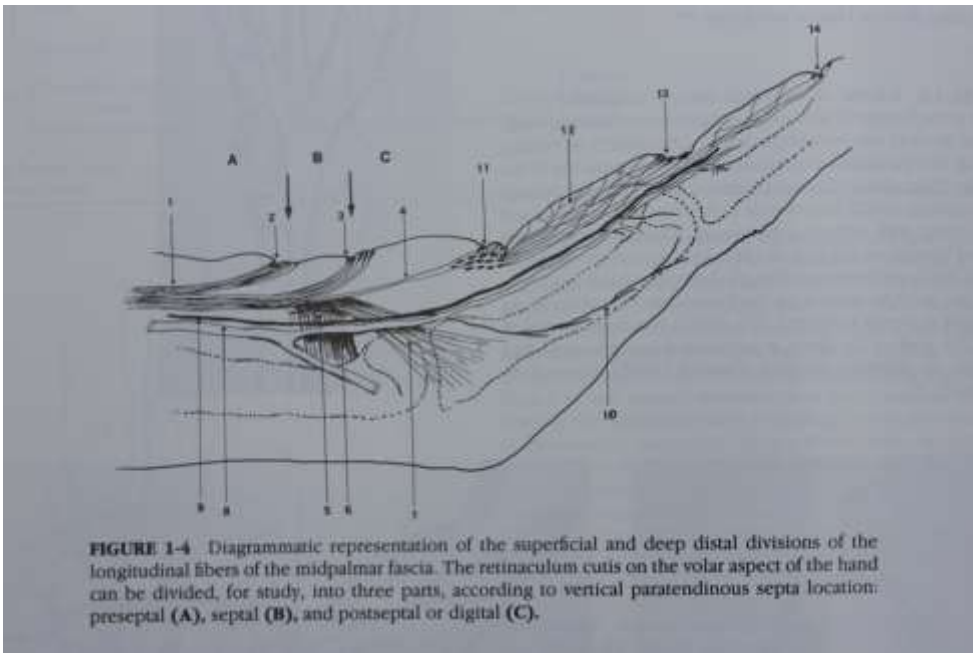
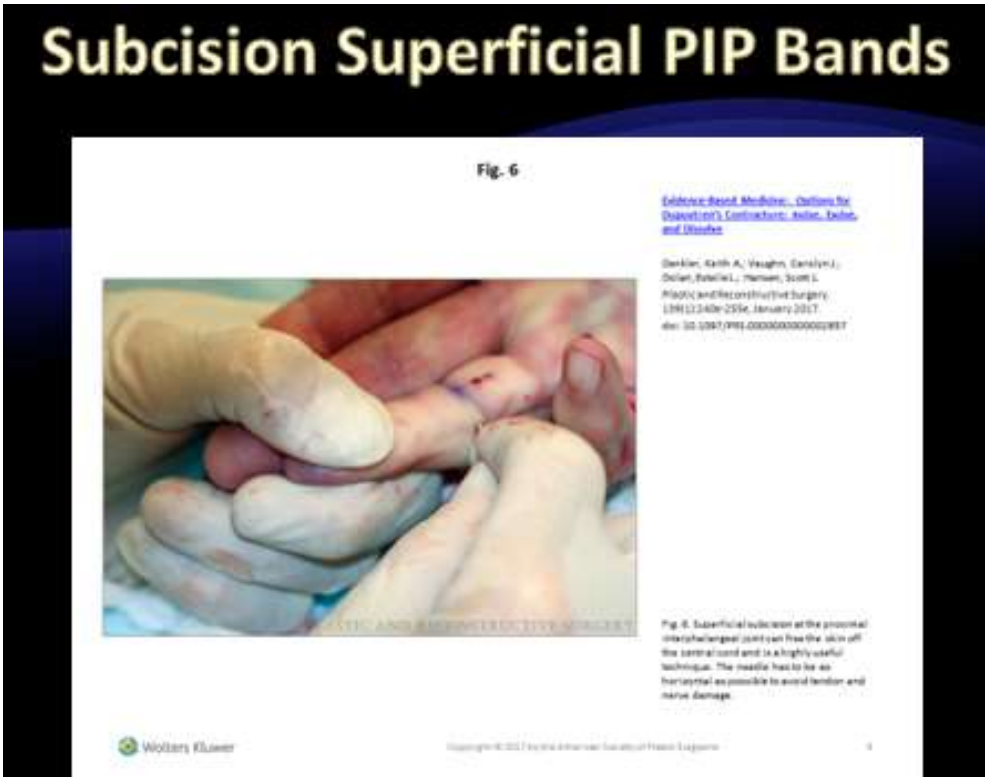


FIGURE 1-4 Diagrammatic representation of the superficial and deep distal divisions of the longitudinal fibers of the midpalmar fascia. The retinaculum cutis on the volar aspect of the hand can be divided, for study, into three parts, according to vertical paratendinous septa location: preseptal **(A)**, septal **(B)**, and postseptal or digital **(C)**.

From Zancolli and Cozzi, *Atlas of Surgical Anatomy of the Hand*. 1992

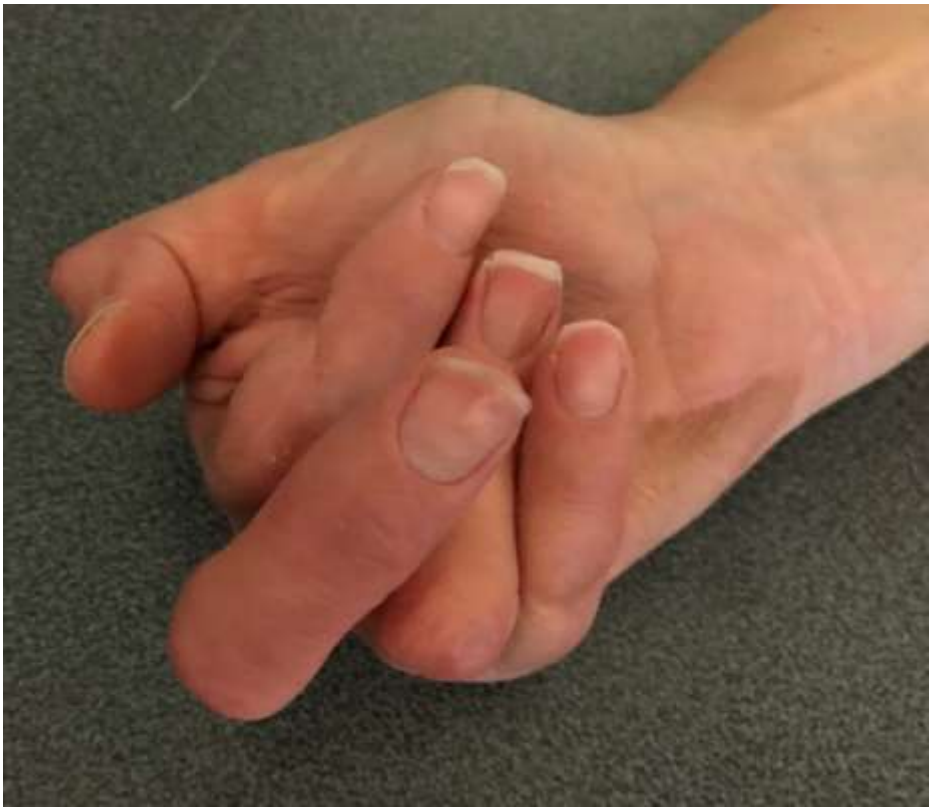
Demonstration of Superficial Subcision at the PIP Joint



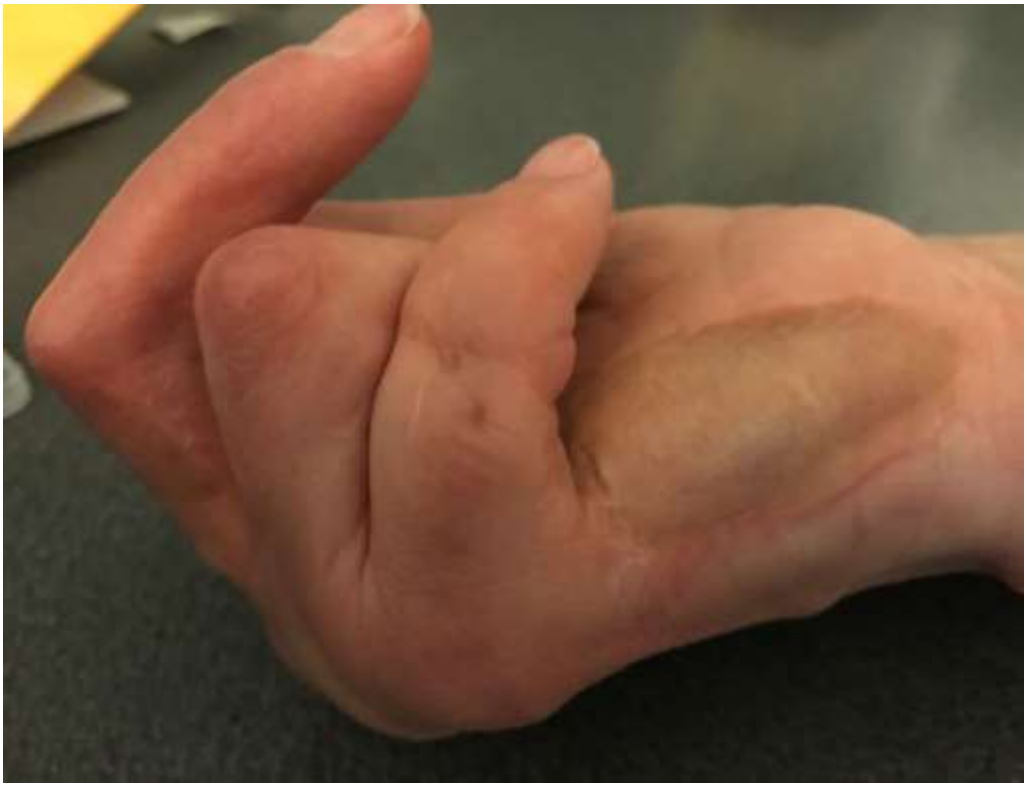
Choosing the right procedure (Incise, Excise, or Dissolve) for the right patient

Young patient

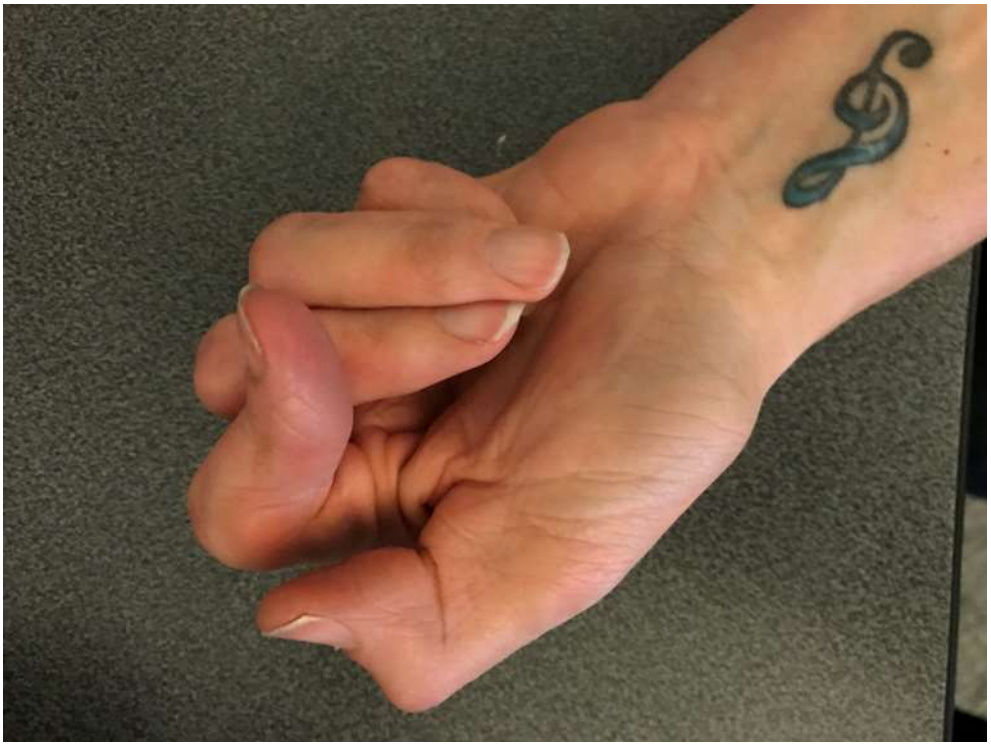
Careful burning bridges



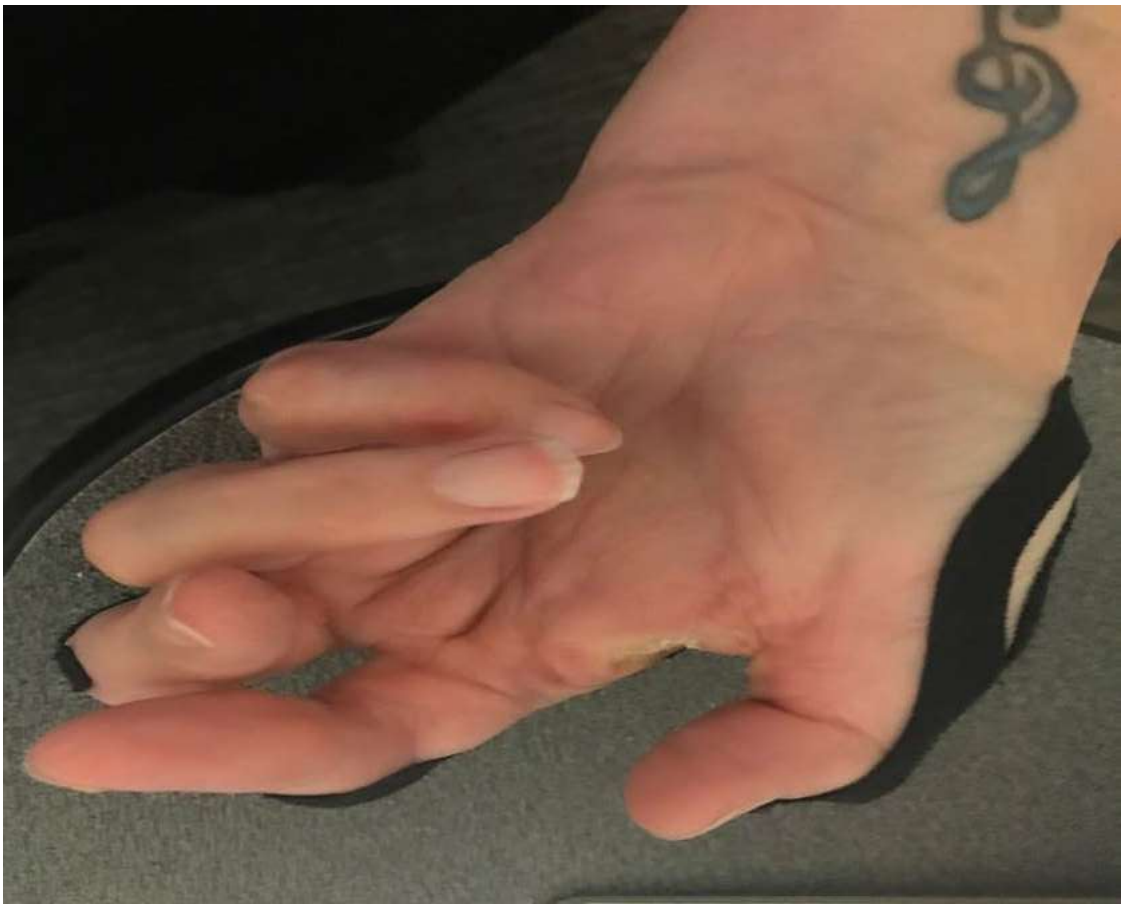
This 41-year-old patient above has had 27 procedures (fusions, skin grafts, and fasciectomies) in the past 31 years on this right hand



Above another view of the same patient after 27 surgical procedures



Above: The left hand has had one collagenase and one needle treatment



Above: Two months after needle aponeurotomy and fat grafting

Patients with no Insurance

Have to keep it simple so consider needle aponeurotomy

Collagenase has an assistance programs which is helpful

Mixing

There will be left over collagenase in the vial

0.90 mg in the vial and 0.58 used

0.32 can be used in other areas or wasted

Document full use of the vial, or wastage in your medical record

Wastage in two vial treatment is .64 mg or enough for a full treatment

Medicare does not want docs treating a patient with two vials and using the leftover (and charging) in another patient.

Mixing

Entire vial contains 0.9mg of collagenase

For MP joint cord dilution: 0.9mg collagenase/ 0.39ml diluent = 2.30 mg/ml (dose of 0.58 mg = 0.25ml)

For PIP joint cord dilution: 0.9mg collagenase/ 0.31ml diluent = 2.9 mg/ml (dose of 0.58mg = 0.20ml)

Pre Numbing

Cold pack as seen below

Ethyl chloride

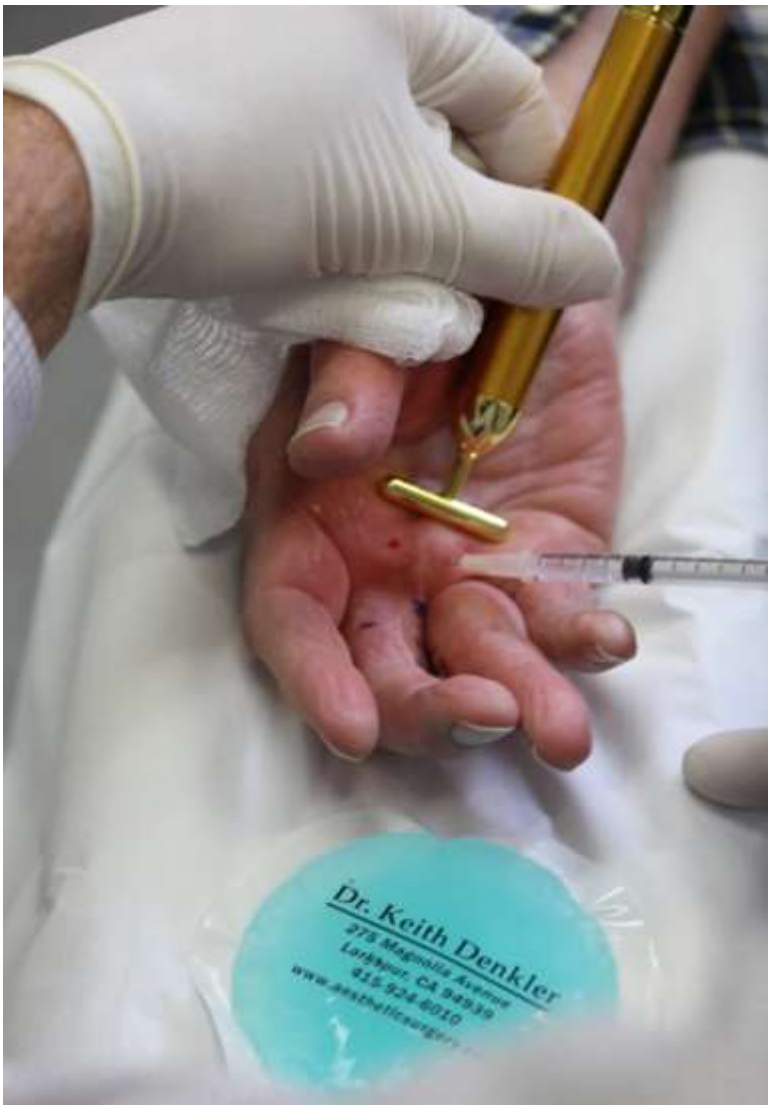
Frozen needle helps for one pass

Vibration seen below can distract

Topical anesthetics work less well on the hand

Literature

Wrist block lessens pain[1]



Numbing

I always pre-numb upstream with a proximal block or wrist block

Have used digital block liposomal bupivacaine for pre-numbing and for extension before 72 hours

I use lidocaine with epinephrine, then 1: 200,000 bupivicaine

For manipulation I tend to use 0.5 cc lido with epinephrine 1: 200,000 mixed 50/50 with 2% lidocaine

Numbing before collagenase and manipulation.[1, 2]

From Sanjuan-Cervero, R. et al 2017

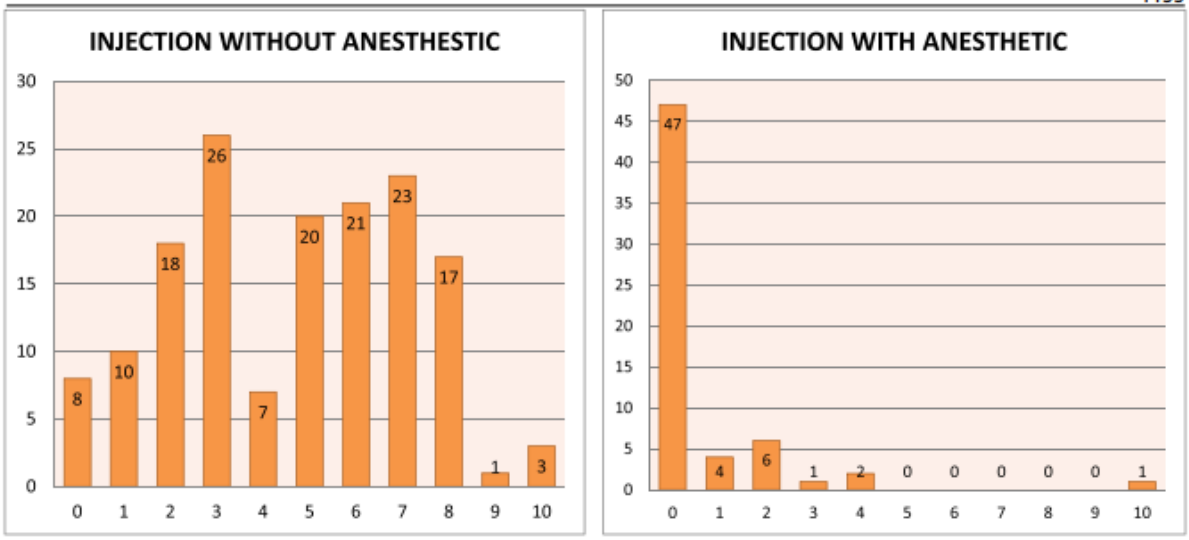


Fig. 2 Numerical rating scale (NRS) pain scores for collagenase clostridium histolyticum (CCH) injection. Detailed data for NRS scores. Y axis represents the number of patients and X axis represents NRS values.

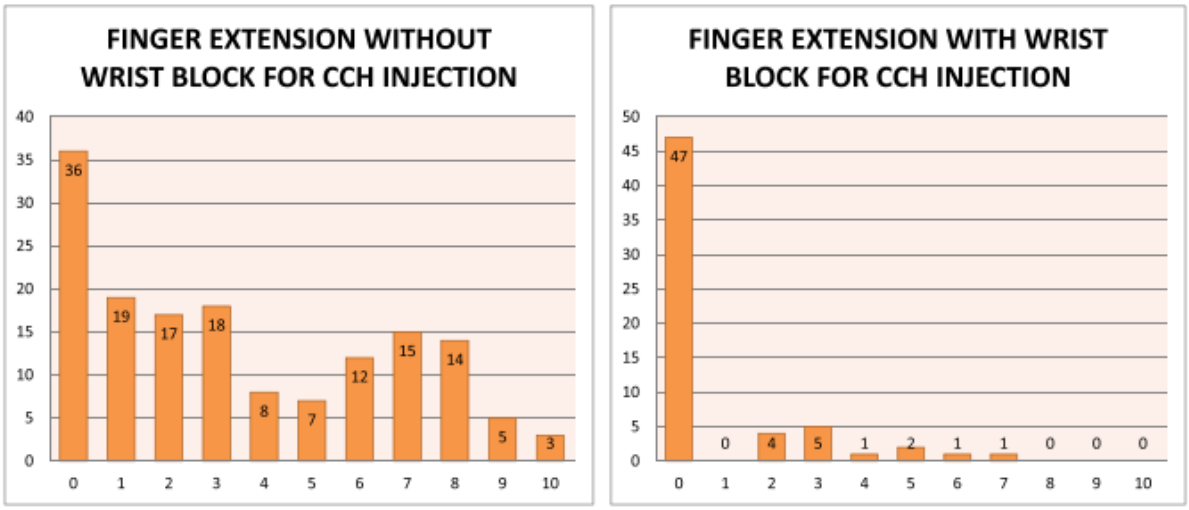


Fig. 3 Numerical rating scale (NRS) pain scores for finger extension. Detailed data for NRS scores. Y axis represents the number of patients and X axis represents NRS values.

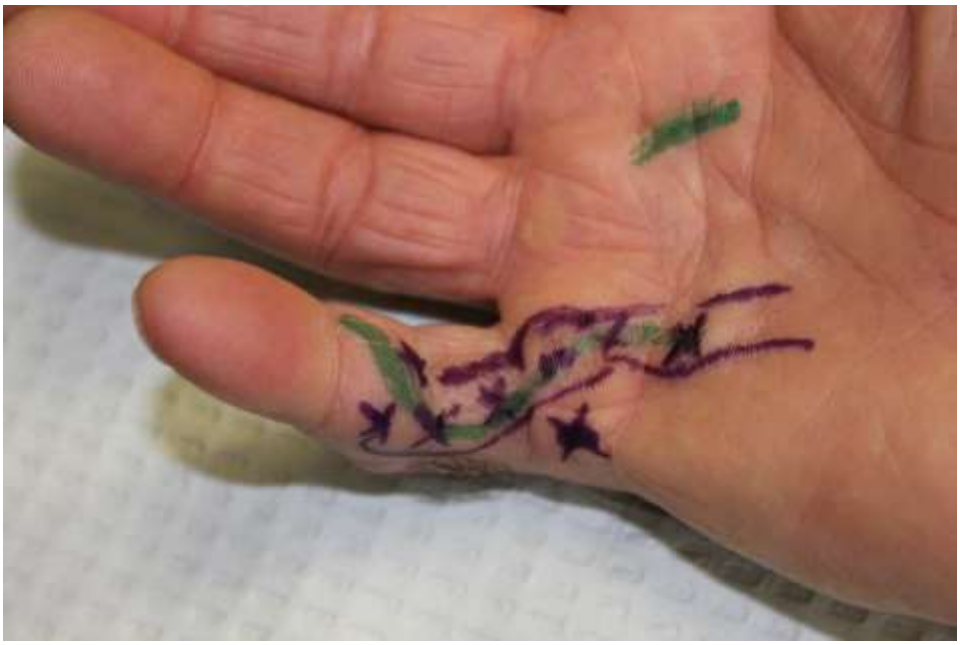
Manipulation

24 to 72 hours is on label recommendation.

One week is very good with level II evidence by Mickelson et al.

Two weeks has also been used in my practice.

Recurrent Dupuytren Contracture after Previous Fasciectomy Treated with Collagenase

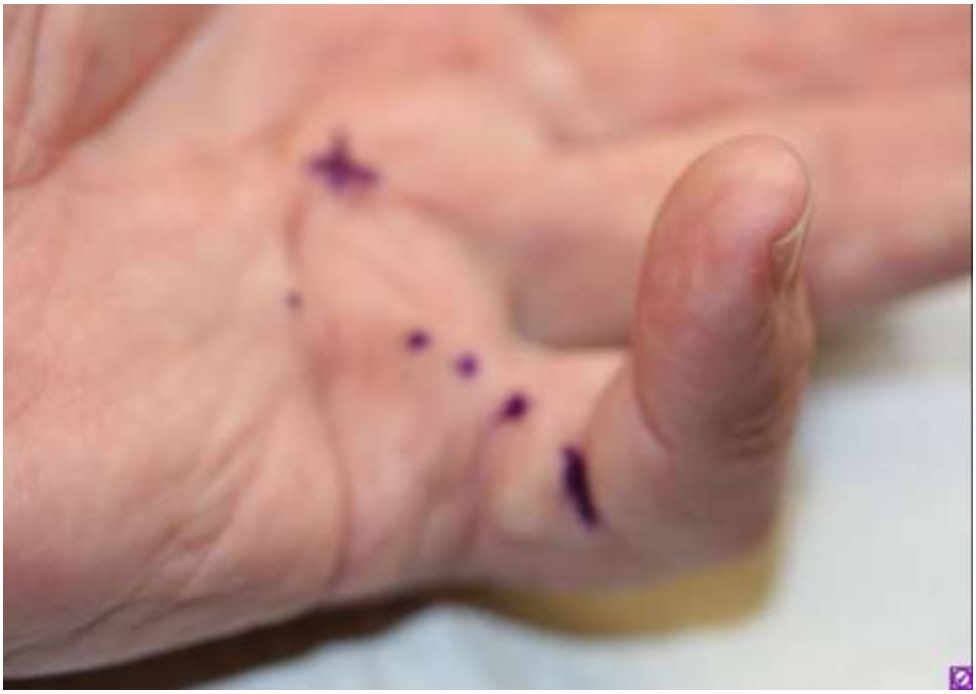


Above, green outlines the previous incisions. Blue are the multiple low dose (0.1mg) injection collagenase including DIP contracture

Above One-year follow-up after the one injection

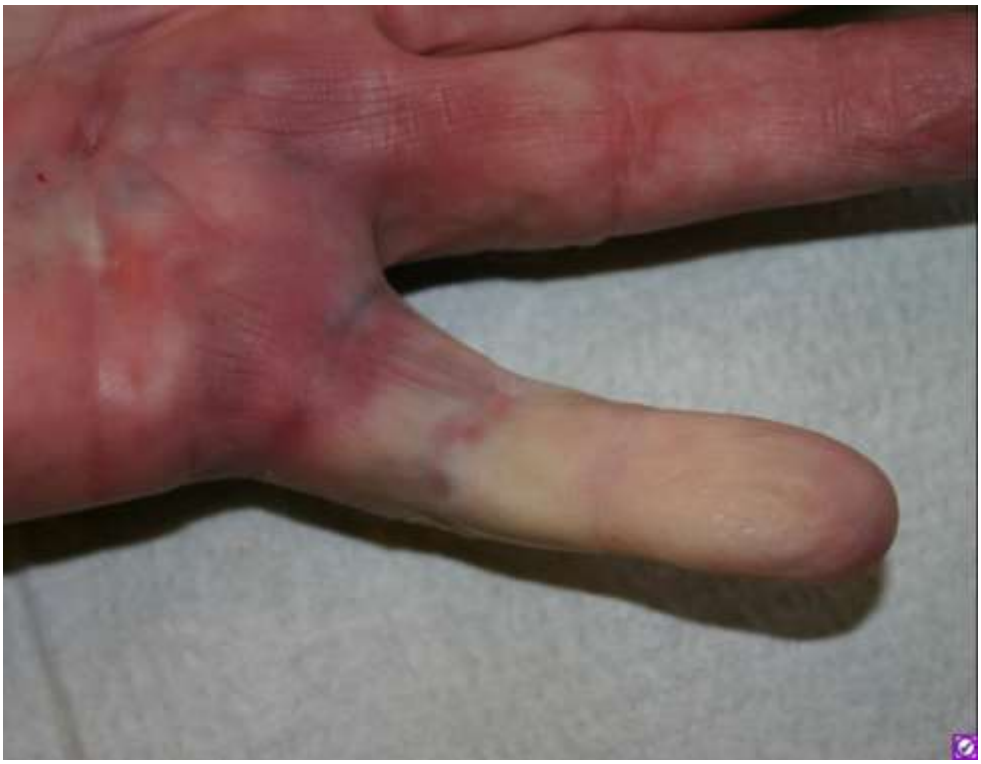
The Severe PIP Stage IV Contracture Treated with Collagenase

Above: Before treatment with one vial 0.9 of collagenase to little and ring fingers



Above: Markings for injection of collagenase

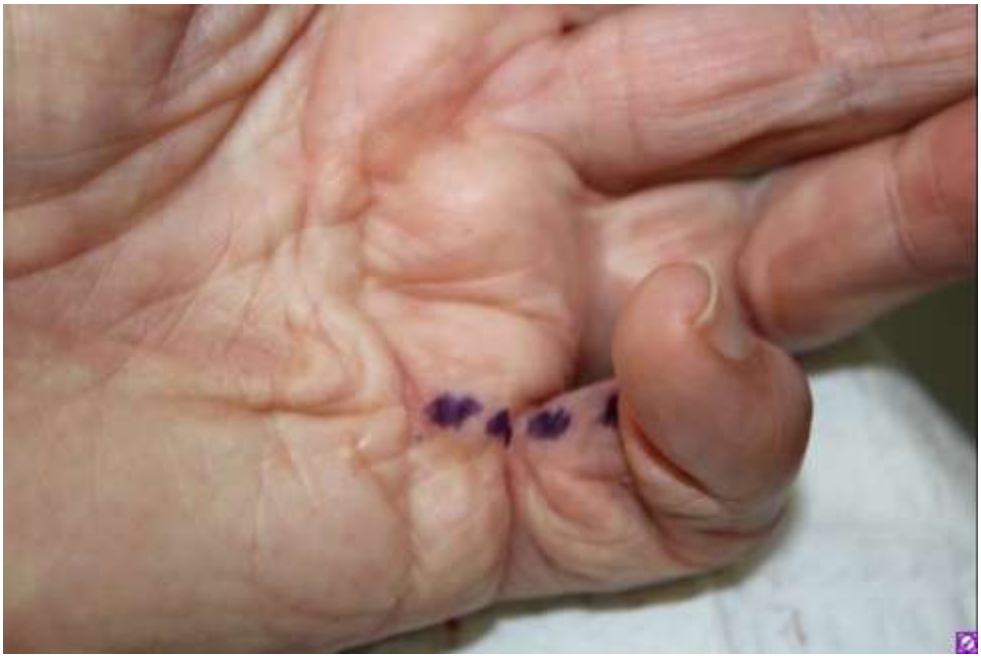
Above: Before manipulation



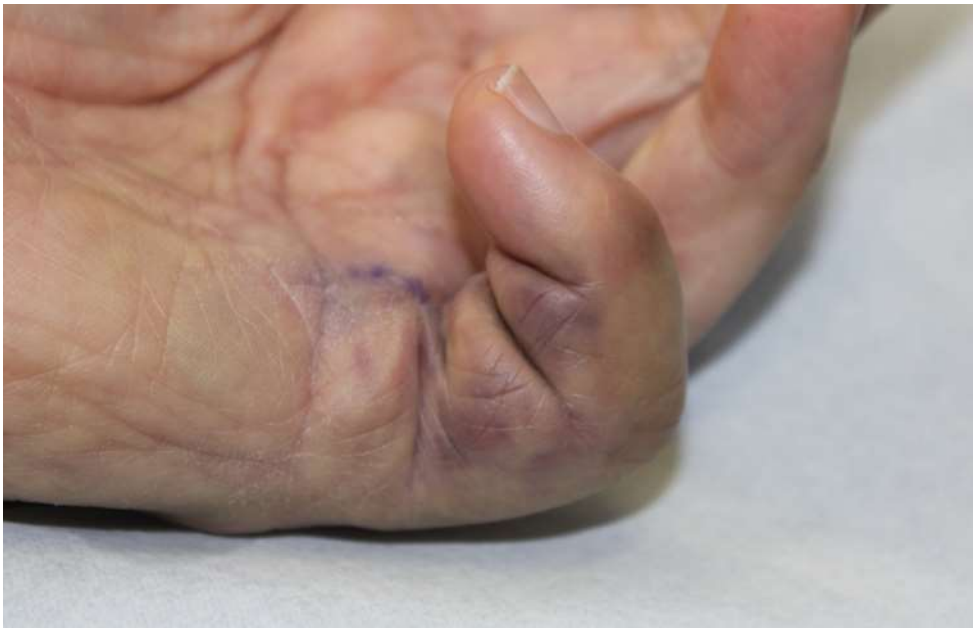
Above: Immediately after injection and not tip is still pink

Above: At two-month follow-up

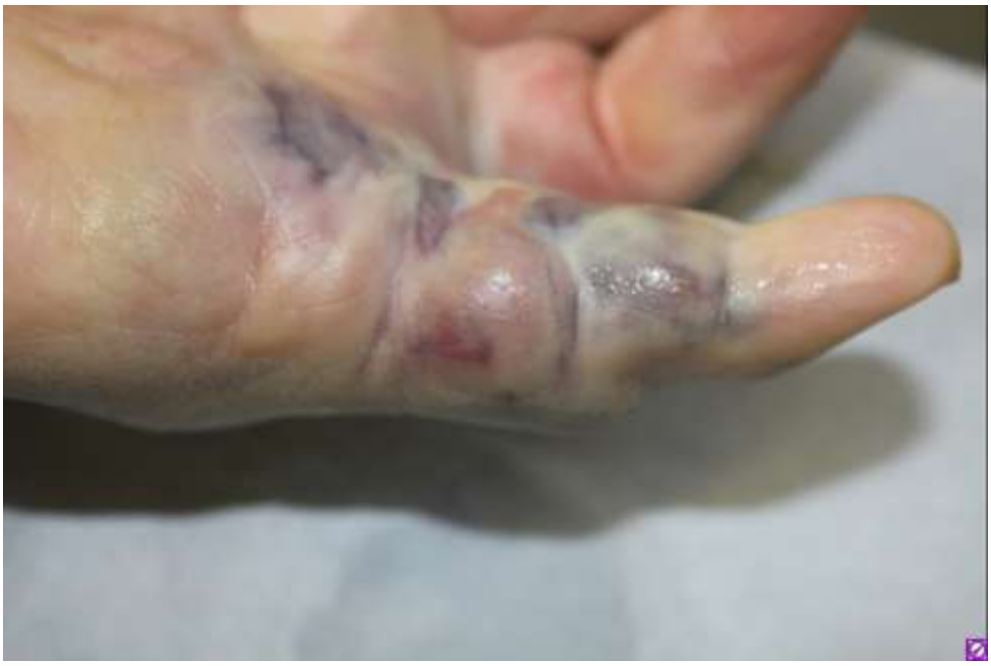
Severe PIP after Previous Fasciectomy



Above: Markings for this patient who had been advised to consider amputation due to recurrent disease and severe recontracture



Above: One week after injection collagenase



Above: Immediately after manipulation

Above: Two-month follow-up photos from home

Efficacy Table

Five-year recurrence with definition as 30-degree increase in passive extension deficit

	Combined	MCP Joint	PIP joint
Needle aponeurotomy >30 ° recurrence	84.9 ° (63% at 3 years)	57 °	70 °
Fasciectomy >30 ° recurrence	20.9 °	21 °	21 °
Collagenase > 30 ° recurrence	32 °	26 °	46 °
Collagenase > 20 ° degree recurrence	47 °	39 °	66 °

From: *van Rijssen, et al 2011 5-year results of randomized clinical trial on treatment in Dupuytren's disease: percutaneous needle fasciotomy versus limited fasciectomy*

Peimer, C. et al 2015 Dupuytren Contracture Recurrence Following Treatment with Collagenase Clostridium histolyticum

Collagenase does not dissolve all

Lalonde[3]

Discussion: Collagenase Clostridium Histolyticum for Dupuytren Contracture: Comparing Single and Concurrent Injections

Donald H. Lalonde,
B.Sc., M.S.C., M.D., D.Sc.
Saint John, New Brunswick, Canada

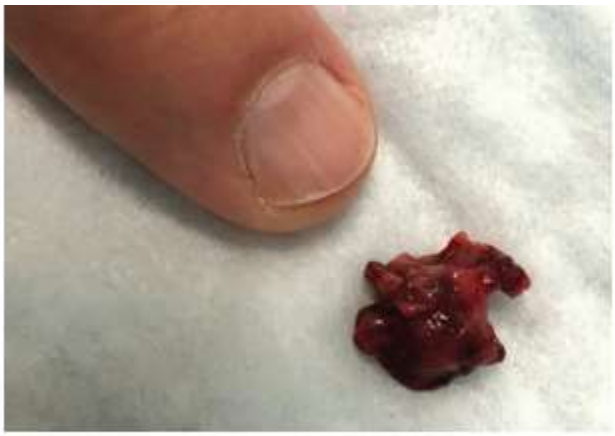
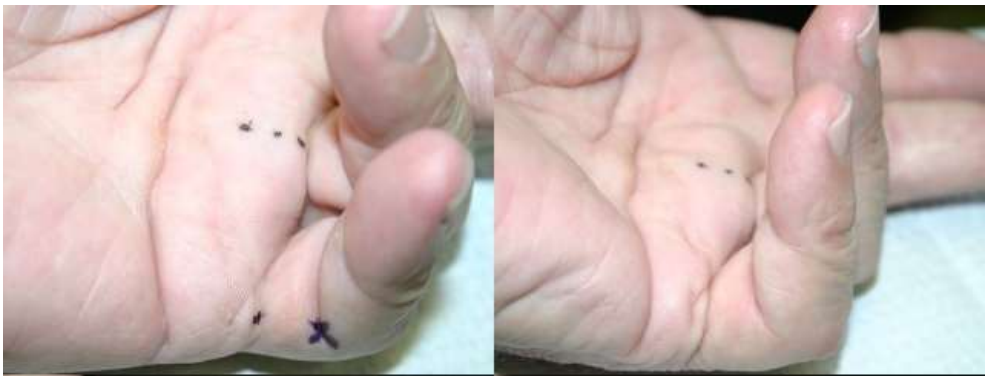


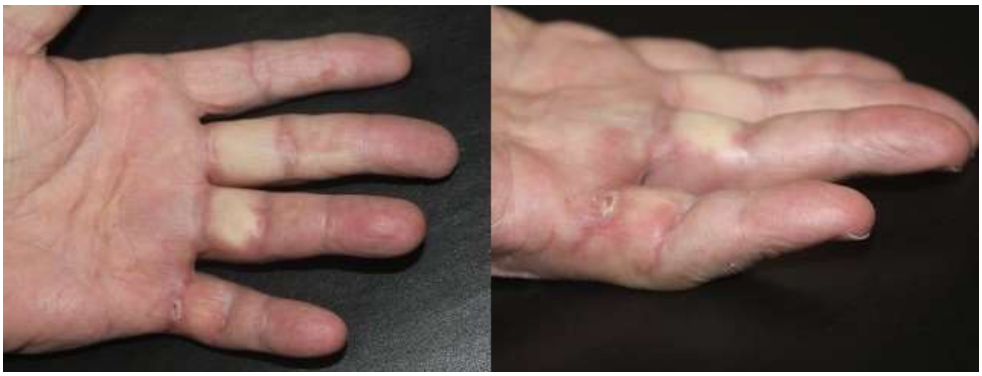
Fig. 1. Firm Dupuytren's nodule extravasated from a tear after single-dose collagenase treatment.

Severe PIP Joint and Collagenase

Severe PIP Contractures of the little and ring fingers before collagenase



At one month following collagenase



Previous radiation

Plastic surgeons often perform surgery in heavily radiated breast tissue after cancer

Anatomy of the finger

One month is possible (long distance commute patient)

Injected, returned, and manipulated/injected at one month, then repeat

Longest six weeks (patient forgot) with some popping

Where Can You Needle with Enzyme

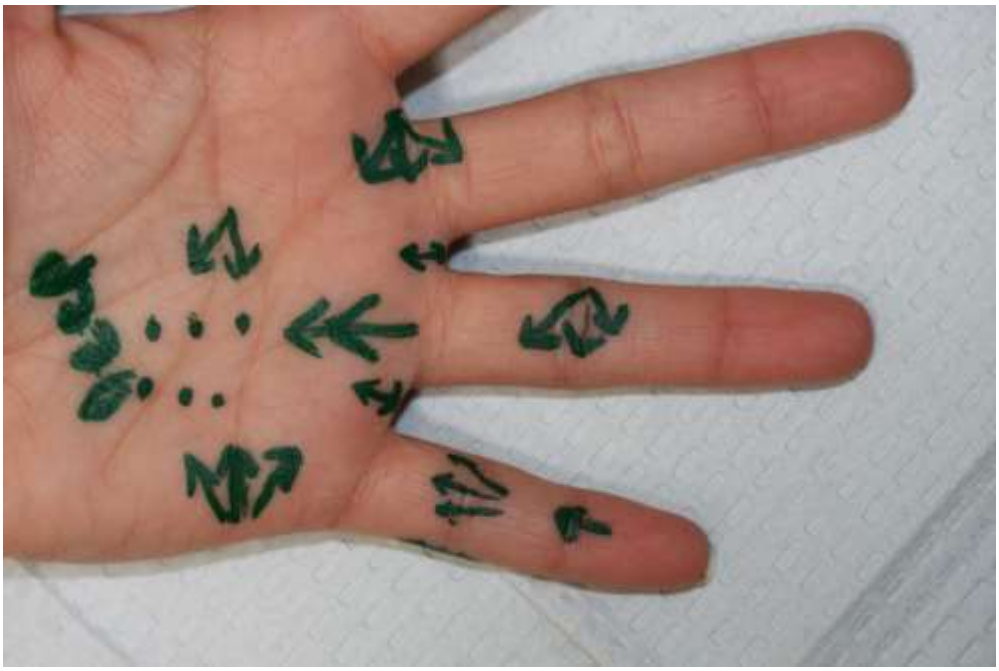
Proximal to distal palmar crease

Natatory cords and superficial subcision

Proximal to distal palmar crease

And thumb web

Nerves are not at risk



Second Stretch

Early recurrence of PIP contracture in up to the first month after injection/manipulation can be re-stretched. Further popping and improvement can occur

Followed by re-splinting and PT/OT.

PIP Joint in Dupuytren's Disease

Tonkin, Burke and Watson.[4]

Adding Needle to Collagenase

Value in the thumb web cords and natatory cords due to lack of nerves

Subcision of superficial skin bands from the cord to the skin is safe and

Proximal cords at the Distal Palmar Crease released by needle allow for further traction distally

Thumb Web

Collagenase

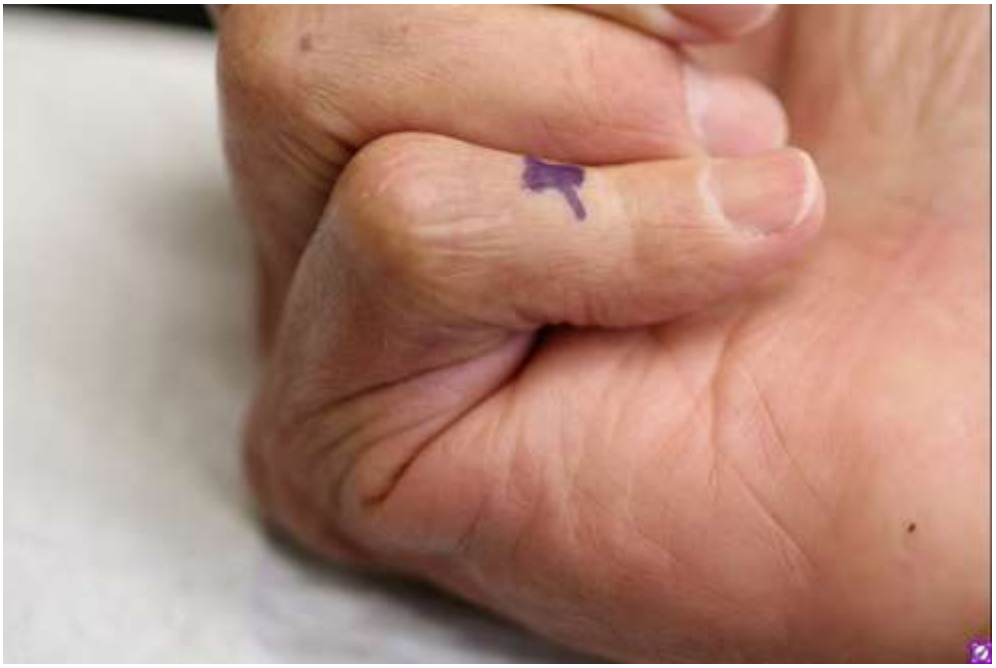
Steenbeek[5]

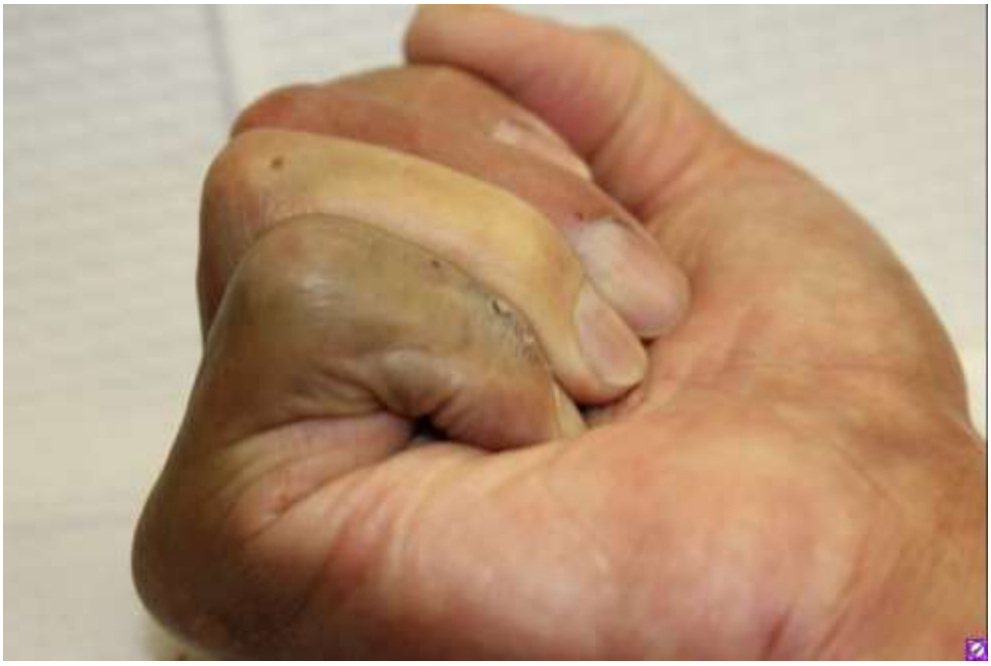
Needle

Boutonniere Contractures

Small doses of collagenase can be used as a tenotomy for boutonniere

Above: 0.01mg or 0.055 cc of fluid for an MCP dose used for Boutonniere





Results Collagenase Fowler Tenotomy for Boutonniere in 13 patients (5.7-month average F/U)

One single injection of small dose collagenase proximal to DIP joint for tenotomy at time of treatment for Dupuytren contracture of MCP joint and PIP joint with boutonniere

DIP hyperextension of 27.3 improved to 8.8 degrees

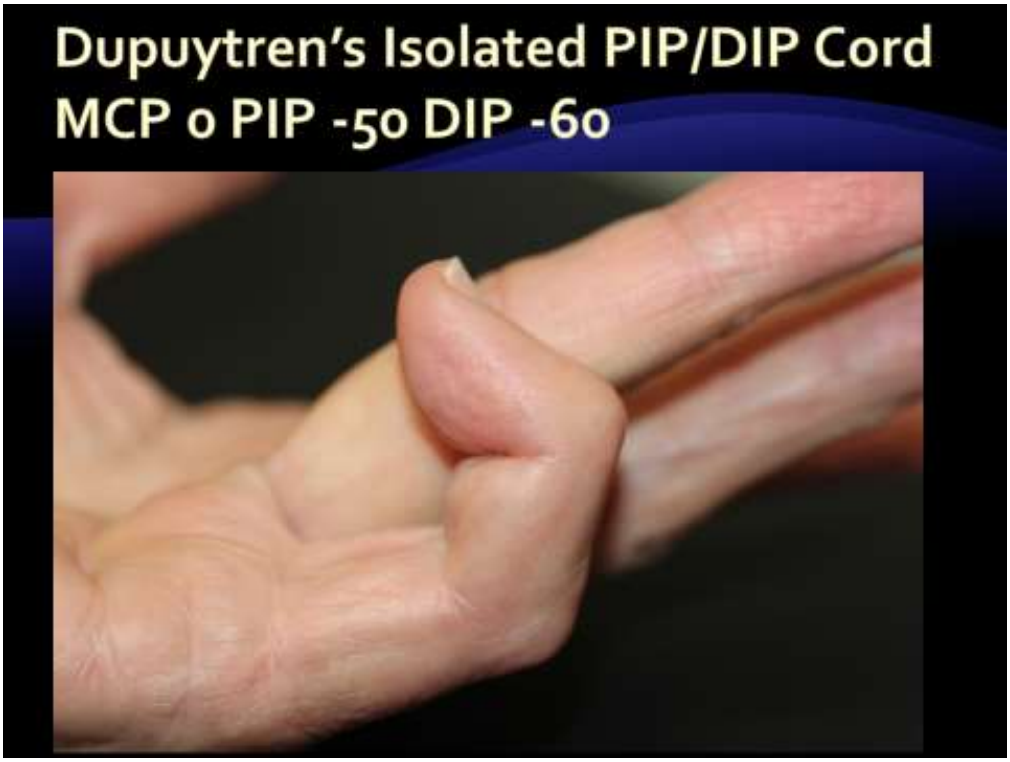
An 18.5-degree improvement

DIP range of motion improved from 28.5 to 35.8 degrees

Ana 7.3-degree improvement

Results submitted to AAHS meeting Jan. 2018

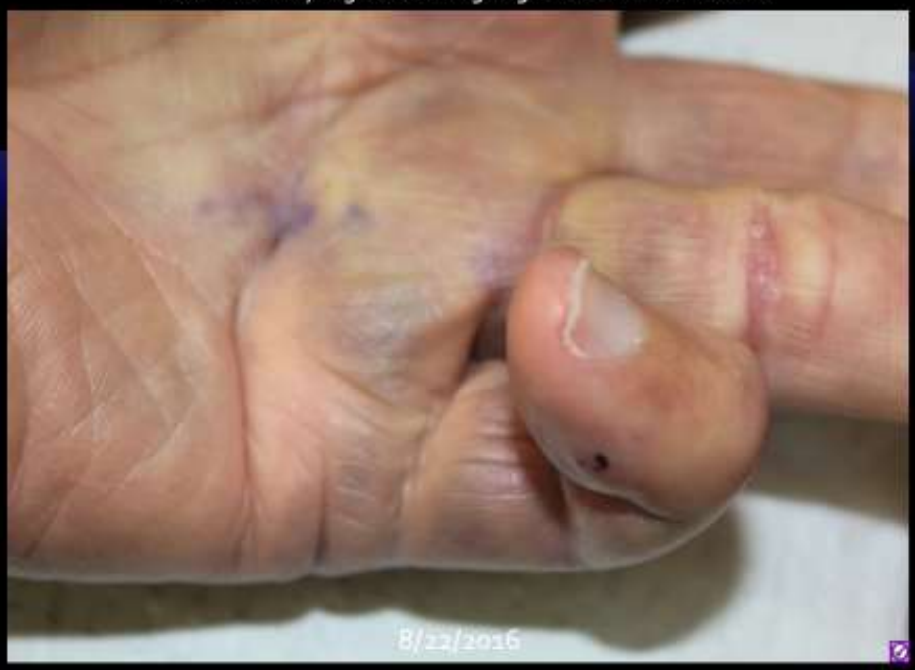
DIP Flexion Contractures



DIP Collagenase

0.1 mg give in two places between PIP and DIP
This is distal to FDS insertion and lateral to profundus

Also dosed 0.7 mg total to ring finger as seen at one week



REFERENCE ON DIP PUBLISHED

DIP collagenase by Fei et al.

Improved extension to less than 5 degree PED in 17/21 patients at 2.6 month followup.[6]

FEI DIP collagenase[6]

DURability collagenase werker at 2 years.[5]

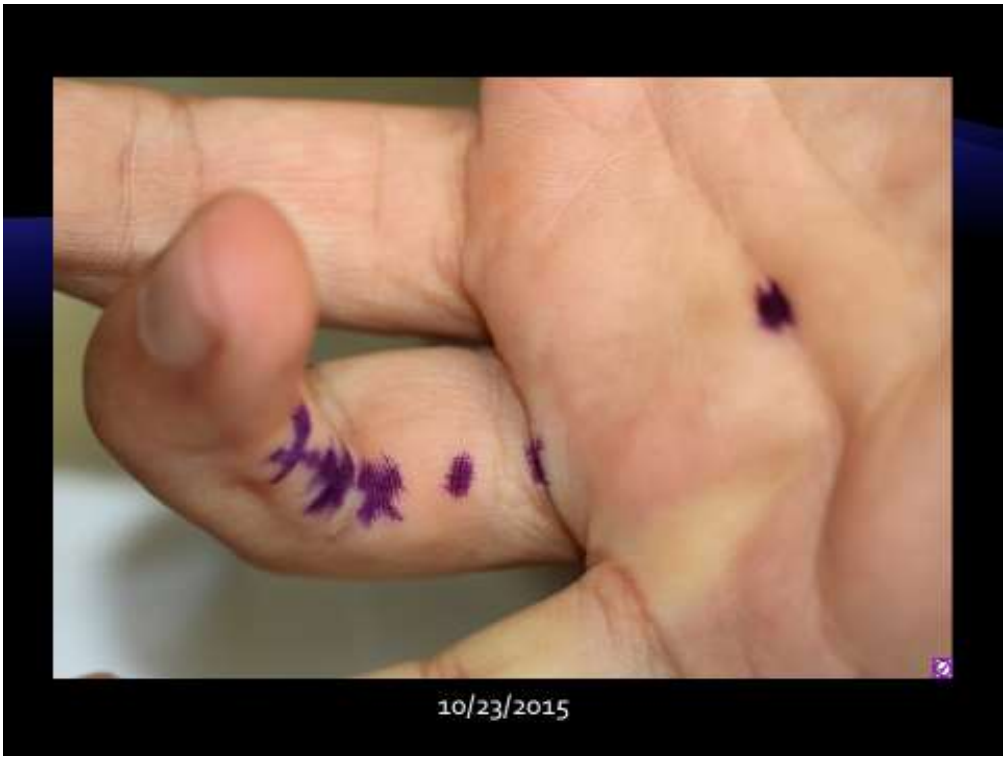
Dip collagenase.

Severe PIP and DIP Contractures Using Small Border Doses of Distal Collagenase

Forty-five year old male with MCP 0 PIP -70 DIP -50 degree contractures

Markings of 0.60 mg of collagenase proximal in three doses

And .3 mg in three doses along the ulnar cord



After manipulation using lidocaine with epinephrine block

At twenty-month follow-up

7/3/2017

7/3/2017

Coumadin

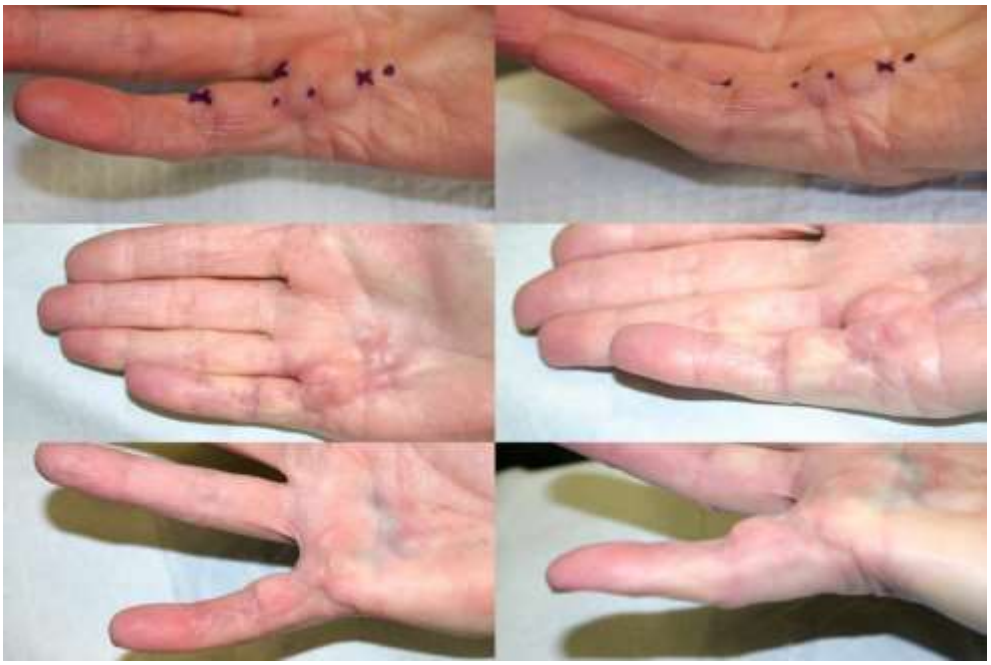
Patients on blood thinners can stop the medication at risk of a stroke, a disastrous problem

Risk of blood thinners and collagenase is localized hematoma treatable with evacuation.

Labels says use with caution and does not prohibit

Patients with abnormal coagulation: Use with caution, including in patients who have received anticoagulant medications other than low dose aspirin within 7 days of the injection.

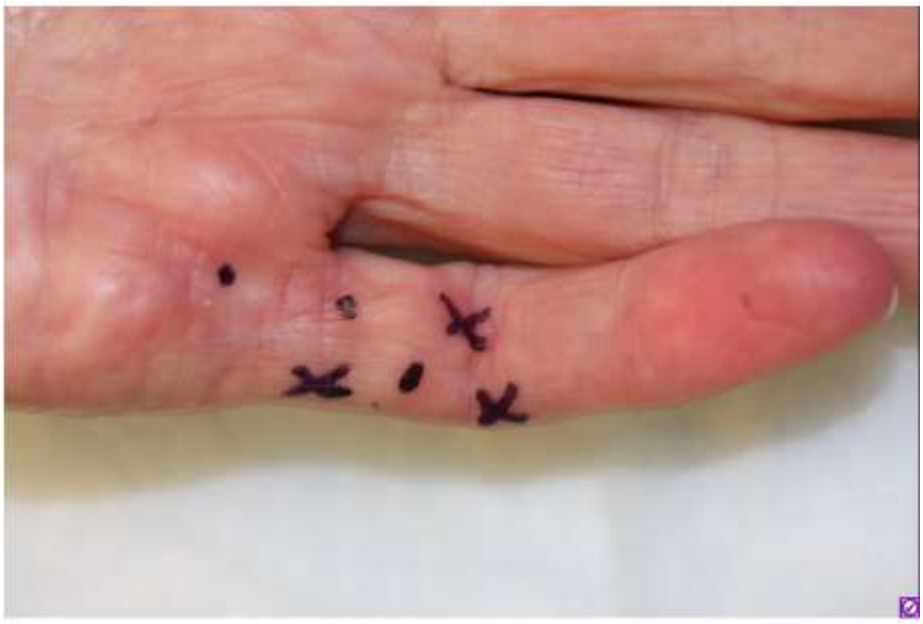
Coumadin: Delay manipulation



Above, before collagenase, delayed manipulation till four weeks, and immediately after manipulation

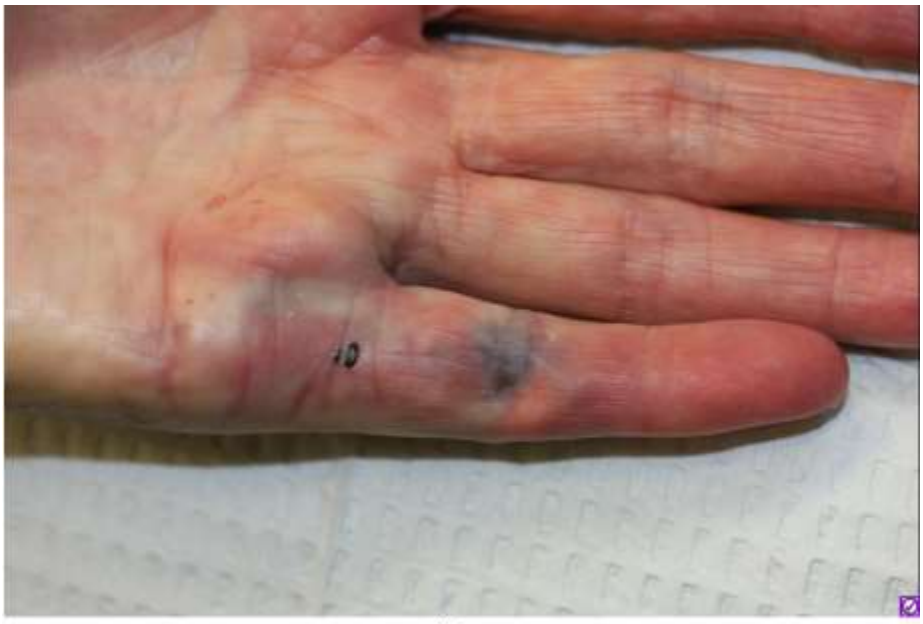
Patient on Coumadin daily.

Coumadin



9/24/2012

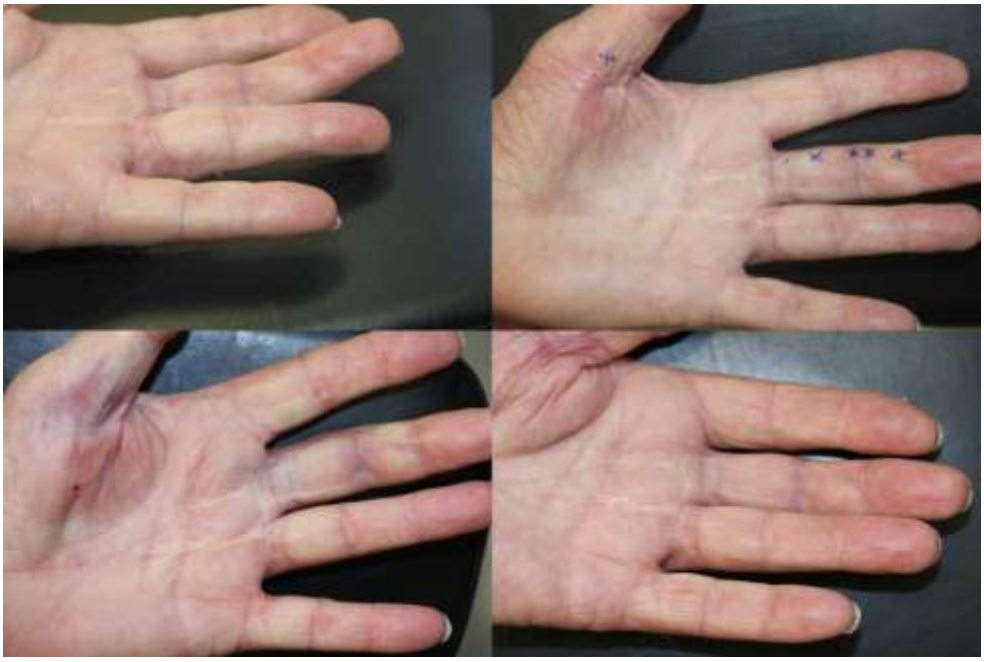
10/9/2012



10/9/2012

DIP Joint Collagenase

Small doses are necessary and can be used on the radial or ulnar sides

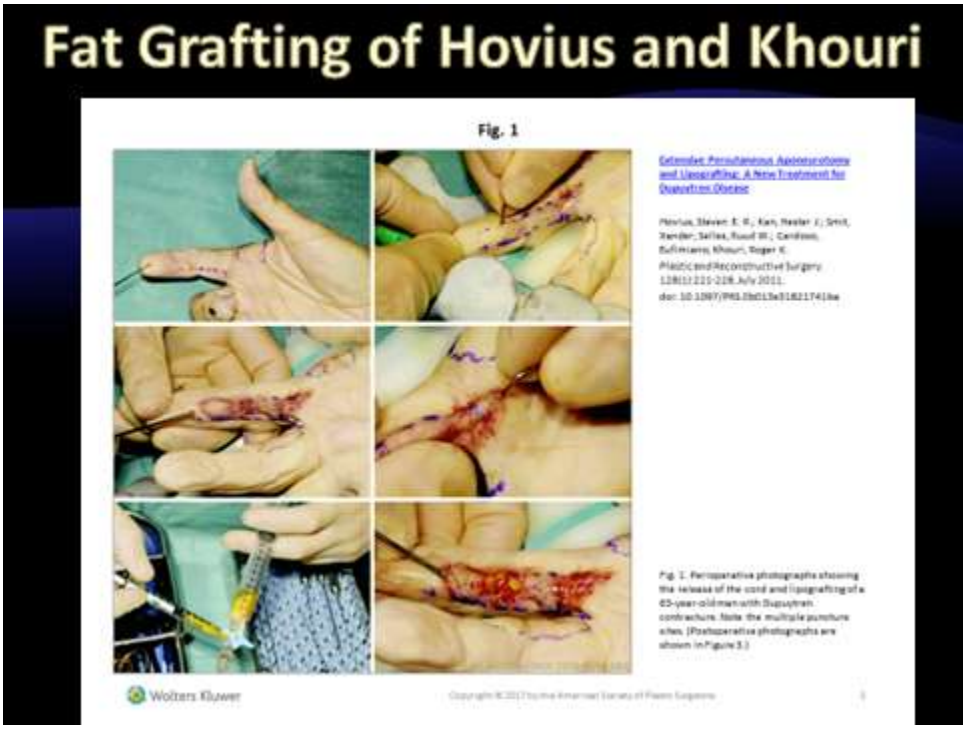


Fat Grafting

Can provide fire break and add padding via living fat grafts

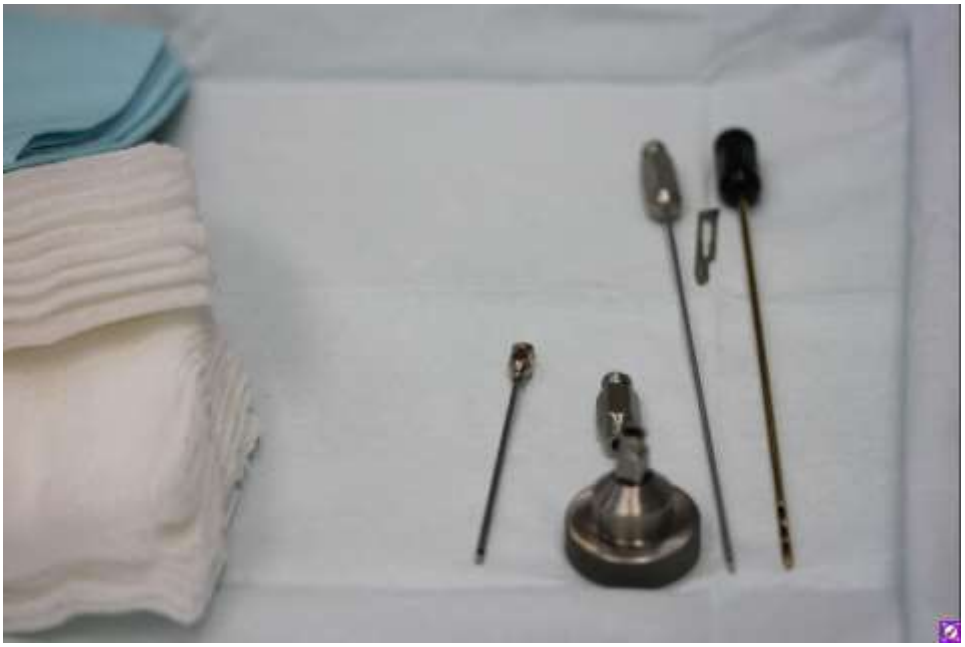
And can provide new stem cells that can teach and help the "injured" fibrotic cells of Dupuytren disease

Fat Grafting of Hovius and Khouri: PALF



Equipment is inexpensive

Local infiltration blunt needle, manual harvesting needle, separation stand, and injection needle



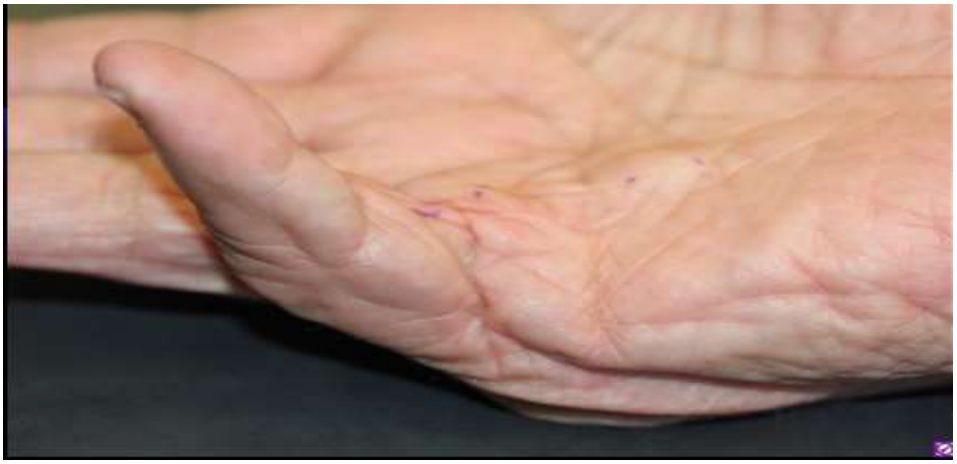
Micro Fat is injected with around 1mm injection ports

Nano Fat can be injected with 30-gauge needle

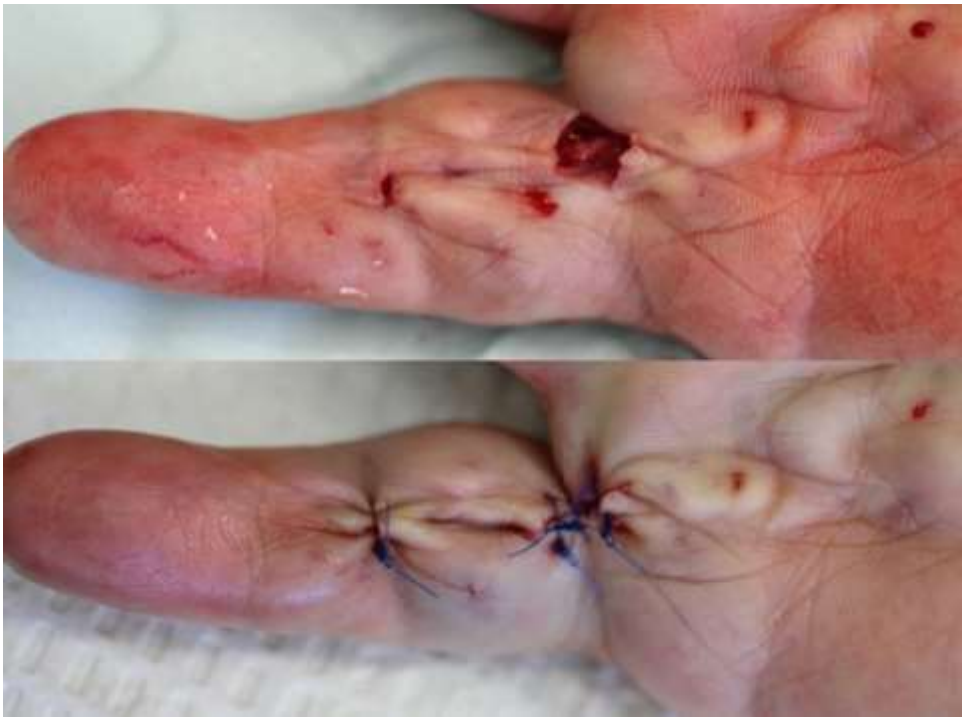
Diamondplasty

At time of fasciotomy as named by Colville 1983

Before needle aponeurotomy and Diamondplasty



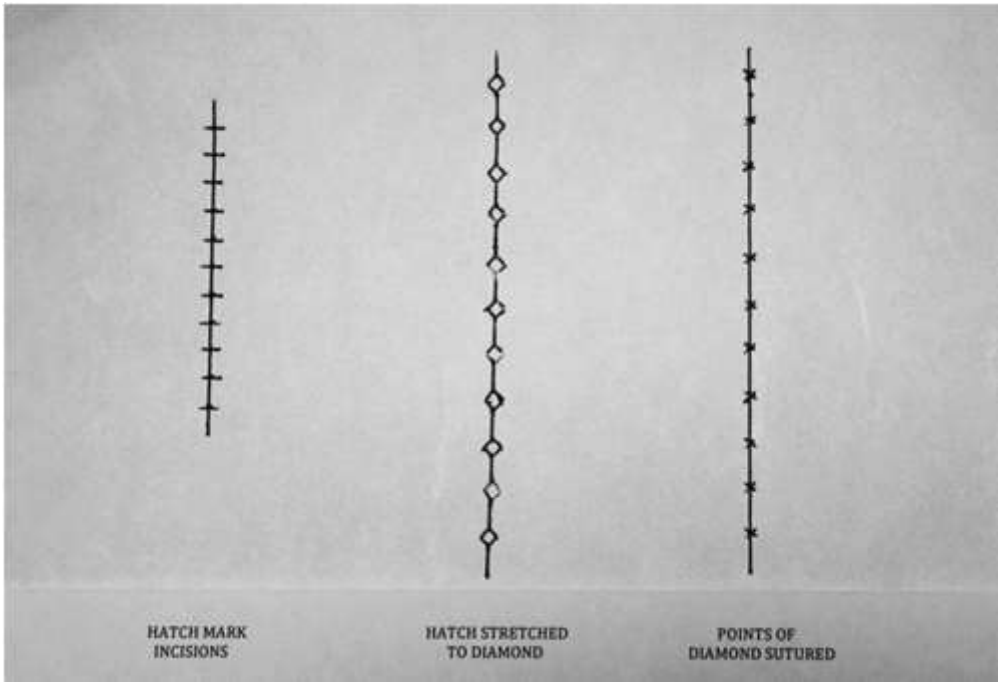
Aponeurotomy skin tears sutured horizontally “Diamondplasty”



Result at suture removal

Diamondplasty

Can treat scars that are at right angles to the creases and much easier than Z-plasty


HATCH MARK
INCISIONS
HATCH STRETCHED
TO DIAMOND
POINTS OF
DIAMOND SUTURED


Hatchmark incisions at RSTL
Lengthen into diamond shape
Single stitch closure
Single stitch to close

The Severe PIP Joint

Joints do not fuse, they need release

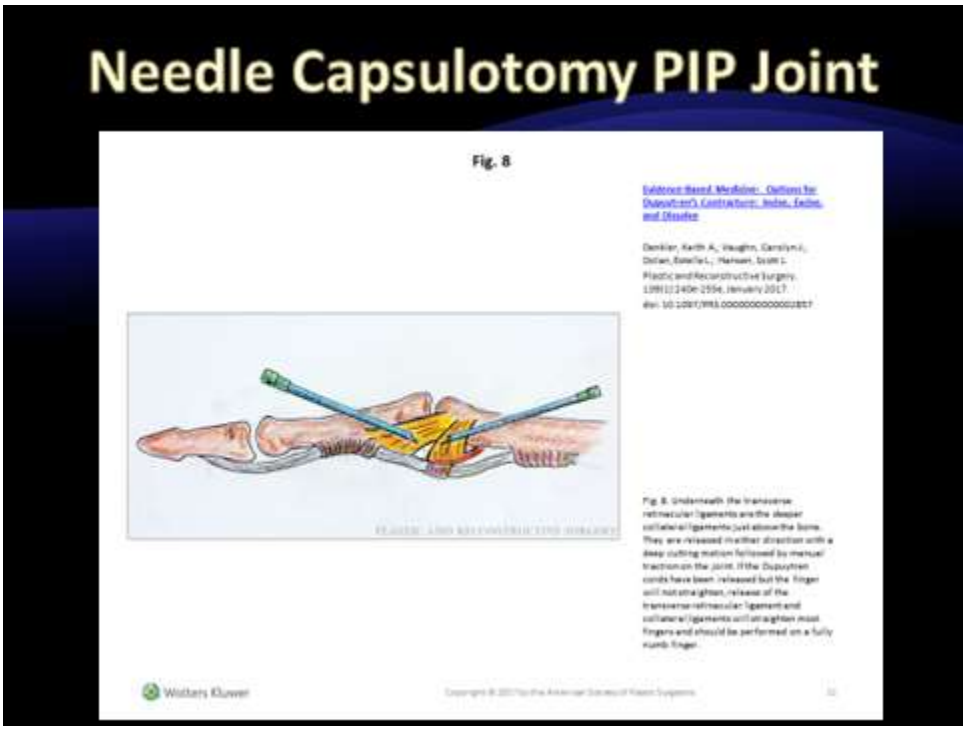
Andrew in 1991 studied 7 amputated Dupuytren PIP joint averaging 95 degrees of contracture

Excision of all Dupuytren cords and tissue did not open the joints

PIP joints in 5s required release of the accessory collateral ligaments to straighten which can be done with a needle via closed capsulotomy

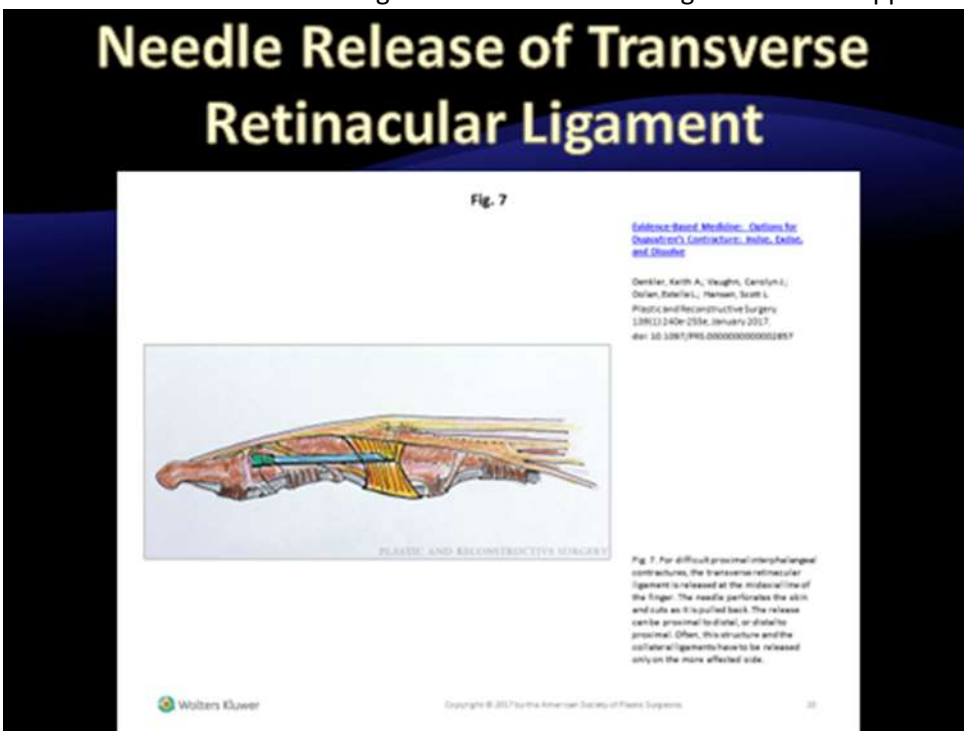
Release of the volar plate straightened the last two.

Needle PIP Joint Capsulotomy



Release of Transverse Retinacular Ligament

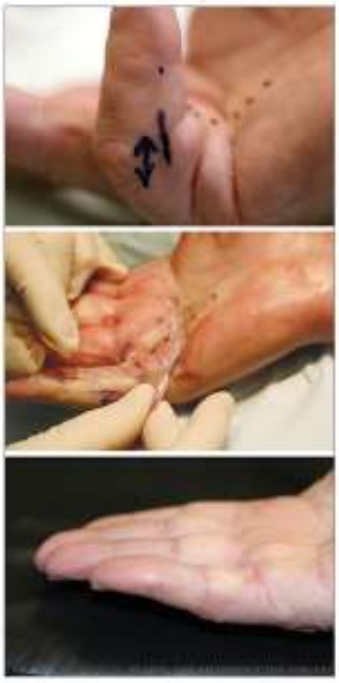
Can assist with releasing contracture and allowing the extensor apparatus to elevate dorsally.



NA Severe Contracture Release Markings

Below: Are the midaxillary markings for PIP capsulotomy and the arrows pointing to release of the transverse retinacular ligament. Also shown is subcision of proximal palmar tissue to mobilize skin.

Fig. 9



Evidence-Based Medicine: Options for Dupuytren's Contracture: Inoise, Excise, and Dissolve

Denkler, Keith A.; Vaughn, Carolyn J.; Dolan, Estelle L.; Hansen, Scott L.
Plastic and Reconstructive Surgery. 139(1):240e-255e, January 2017.
doi: 10.1097/PRS.0000000000002857

Fig. 9. (Above) Stage IV Dupuytren's contracture marked for needle and joint releases. The midaxial line is marked at the proximal interphalangeal joint. Release of the transverse retinacular ligament is dorsal to this line. Collateral ligament release is deep. Dupuytren's disease often affects only one side of the finger. (Center) The finger has been opened, the proximal interphalangeal joint has been released, and additional release of the distal palmar crease is shown. (Below) Many patients with stage IV disease and needle will benefit from additional touch-up enzyme; however, this patient has an excellent result at 1 year.

Wolters Kluwer

Staged Treatment

Preliminary fasciotomy followed by touch up collagenase

NA Technique

Stromberg[7]

Satisfaction

Patient[8]

Thoughts

Onabotulinumtoxin A to reduce contracted FDS or FDP during recovery from collagenase or needle aponeurotomy and take tension off PIP joint flexion

Successful treatment of Dupuytren proximal interphalangeal joint (PIP) joint contractures remains a problem. Options for treatment include presurgical fasciotomy, preliminary soft-tissue distraction, checkrein ligament release, joint capsulotomies, release of the digital flexor sheath, joint pinning, tendon lengthening, and early hand therapy.

Onaotulinum toxin A, already FDA approved for muscle spasticity of the fingers after stokes (30-50 u) has a role in weakening the contracted flexor digitorum sublimis muscle found in longstanding, severe PIP joint Dupuytren contractures.

METHODS

Four patients with more than 60-degree Dupuytren PIP joint contractures that failed previous treatments were administered one dose 10 to 20 u of botulinum toxin administered to the sublimis muscle of the involved PIP finger contracture during their treatment. For NA it was at the time of the procedure and for collagenase it was at the time of the initial administration of collagenase.

RESULTS

Patient	Finger	Treatment	Dose Botulinum Toxin	PIP Before	PIP After	Gain PIP	F/u Months	Prev. Treatments
1	L Little	NA	10 u FDS	-100	-25	75	8	Prev. NA
2	R Little	(2) Treatments of Collagenase	20 u FDS	-90	-15	75	5	Prev. NA
3	R Little	NA	20 u FDS	-70	-25	45	5	Prev. NA
4	R Little	NA + Fat Graft	20 u FDS	-60	-25	35	2.5	Prev. NA
Average				-80	-22.5	57.5	5.1	

Significant improvement in little finger severe PIP contractures at early follow-up

CONCLUSION

Onabotulinum toxin A injections into the sublimis tendon helps PIP contractures during the early postoperative stage. Botulinum toxin may be used with all three techniques for release of Dupuytren contracture: Fasciotomy, fasciectomy, and collagenase. With collagenase, an on-label repeat treatment would be of benefit during the period (approx. four months) of botulinum toxin effect.

Fig. 1 Eight-month F/U after NA and 20u Botulinum toxin to R little FDS

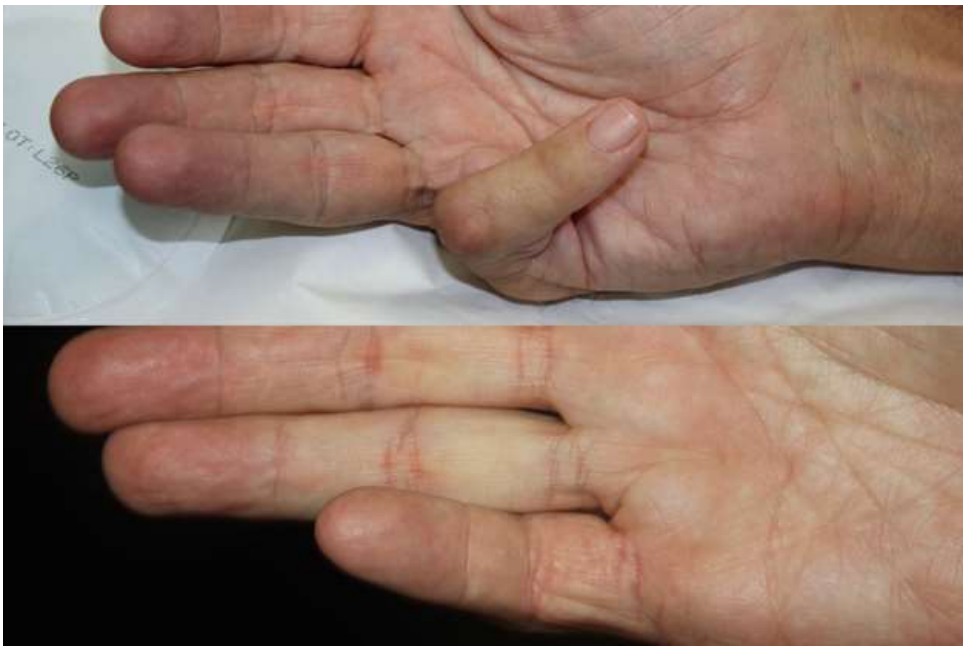


Fig. 2 PIP -100 to PIP -25-degree PIP with full passive extension (not shown).

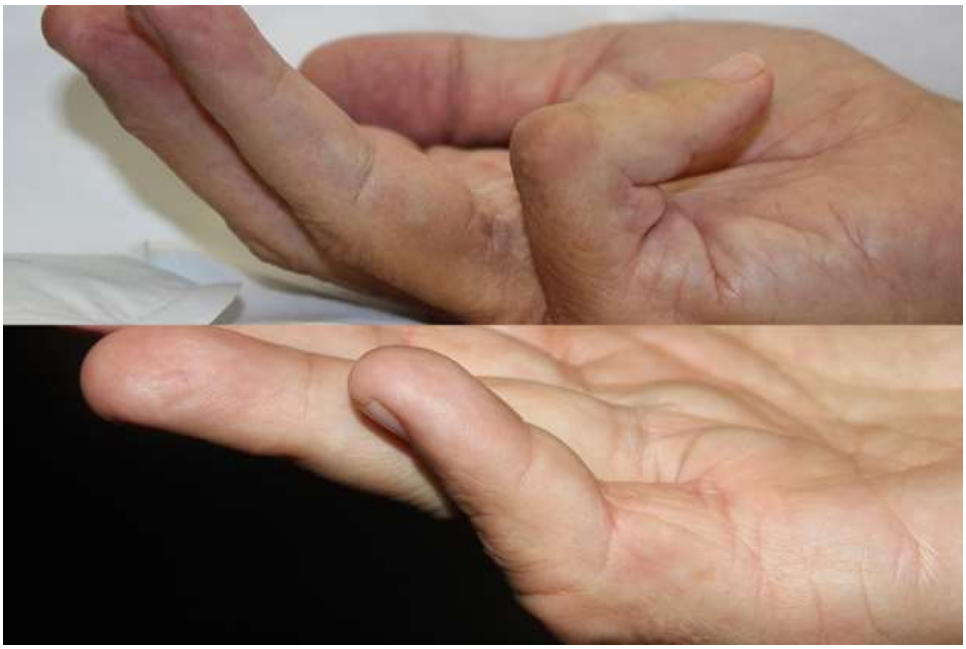
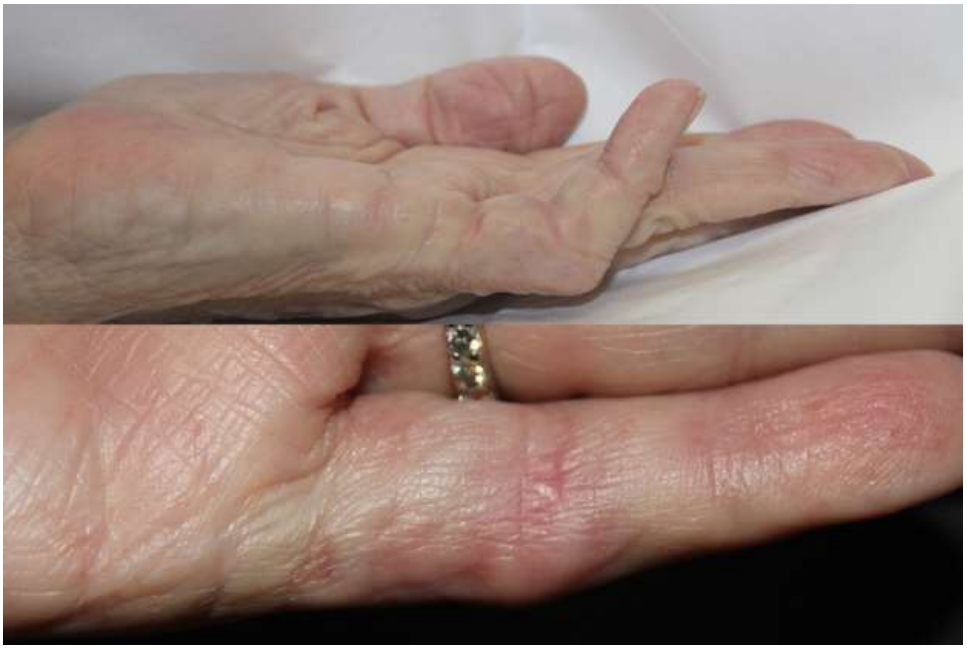


Fig. 3 Three month follow-up after NA/Fat grafting and 20 u Botulinum to FDS left little finger



1. Sanjuan-Cervero, R., et al., *Pain Associated With Treatment of Dupuytren Contracture With Collagenase Clostridium histolyticum.* J Hand Surg Am, 2017. **42**(2): p. e109-e114.

2. Nordenskjold, J., et al., *Benefit of Local Anesthesia in Reducing Pain during Collagenase Injection for Dupuytren's Contracture.* Plast Reconstr Surg, 2017. **140**(3): p. 565-569.
3. Lalonde, D.H., *Discussion: Collagenase Clostridium Histolyticum for Dupuytren Contracture: Comparing Single and Concurrent Injections.* Plast Reconstr Surg, 2019. **143**(4): p. 788e-789e.
4. Tonkin, M.A., F.D. Burke, and J.P. Varian, *The proximal interphalangeal joint in Dupuytren's disease.* J Hand Surg Br, 1985. **10**(3): p. 358-64.
5. Steenbeek, L.M., M.M. Dreise, and P.M.N. Werker, *Durability of Collagenase Treatment for Dupuytren Disease of the Thumb and First Web After at Least 2 Years' Follow-Up.* J Hand Surg Am, 2018.
6. Fei, T.T., et al., *Collagenase Clostridium histolyticum for the Treatment of Distal Interphalangeal Joint Contractures in Dupuytren Disease.* J Hand Surg Am, 2019. **44**(5): p. 417 e1-417 e4.
7. Stromberg, J., *Percutaneous Needle Fasciotomy for Dupuytren Contracture.* JBJS Essent Surg Tech, 2019. **9**(1): p. e6.
8. Buckwalter V, J.A., et al., *Needle Aponeurotomy Versus Collagenase Injections for Dupuytren Disease: A Review of the Literature and Survey of Patient-Reported Satisfaction, Recurrence, and Complications After Needle Aponeurotomy.* Journal of Hand Surgery Global Online, 2019. **1**(2): p. 91-95.